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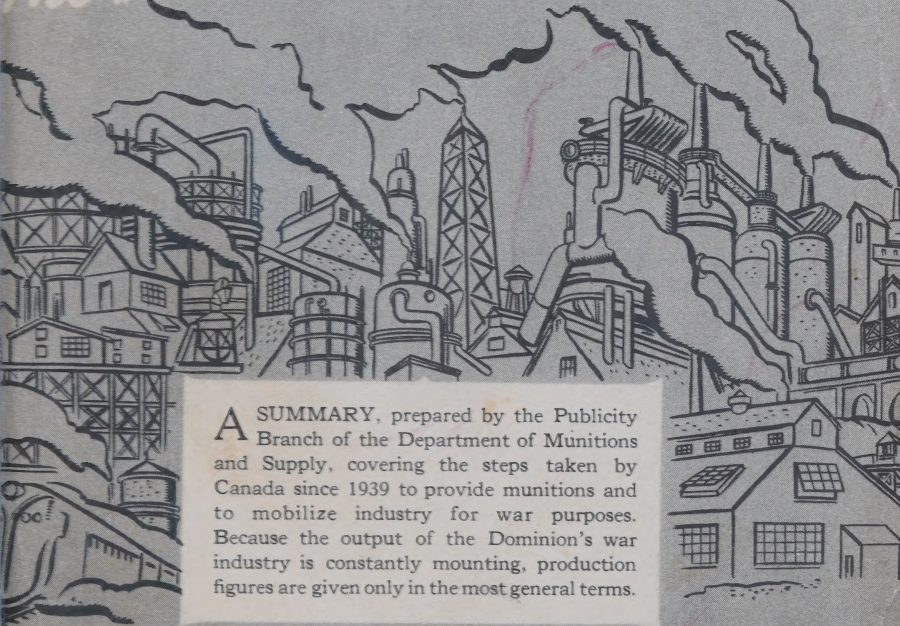


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The INDUSTRIAL FRONT



A SUMMARY, prepared by the Publicity Branch of the Department of Munitions and Supply, covering the steps taken by Canada since 1939 to provide munitions and to mobilize industry for war purposes. Because the output of the Dominion's war industry is constantly mounting, production figures are given only in the most general terms.

DEPARTMENT OF MUNITIONS AND SUPPLY

HONOURABLE C. D. HOWE, *Minister*

Volume 3

Revised to January 1, 1943

It is the purpose of this booklet to present in broad outline the organization and activities of the Department of Munitions and Supply.

As production rates vary from day to day, reference to them herein is made only in the most general terms. The record of the orders issued by the War-time Industries Control Board is complete up to December 31, 1942.

It is my hope that this booklet will give some indication of the nature and scope of the activities of the Department of Munitions and Supply.

C. D. HOWE,
Minister of Munitions and Supply.

FO REWORD

Under the green roofs of four of Ottawa's sprawling temporary buildings lies the nerve-centre of Canada's industrial war effort. It is the Department of Munitions and Supply, and from it stems the administration of Canada's biggest business: the business of providing ships and tanks, planes and guns, ammunition and explosives for use by the United Nations on battle fronts the world over; the business of purchasing all the requirements of the Dominion's Armed Services, from buckets to boilers, from candles to carpets.

The operations of this vast wartime organization, employing some 4,700 men and women, and reaching out through district offices to virtually every corner of the Dominion, are conducted through four main channels: Administration, Production, Supply, and Crown Companies.

The pages which follow are intended to indicate in broad outline the results which have attended the efforts of the Department to mobilize the resources of the Dominion and to expand its industrial production in order to meet the requirements of a nation at war.

Since the booklet is intended primarily for reference purposes, any effort to tell the story as a story has been subordinated to the presentation of chronological fact.

THE INDUSTRIAL FRONT

Table of Contents

Administration:

	Page
Organization	5
Defence Purchasing Board	5
War Supply Board	5
Department of Munitions and Supply	6
Controllers	7
Wartime Industries Control Board	8
Crown Companies	9
Plant Expansion	10
Purchasing Routine	12
Statistics	14
Priorities	16

Production:

Introduction	23
Aircraft	32
Ammunition	37
Automotive Vehicles	41
Construction	43
Explosives and Chemicals	45
General Purchasing	50
Guns and Small Arms	58
Ships	62

Supply:

Wartime Industries Control Board	67
Aircraft Control	71
Chemicals Control	72
Construction Control	79
Machine Tools Control	83
Metals Control	87
Motor Vehicle Control	121
Oil Control	126
Power Control	142
Rubber Control	148
Ship Repairs and Salvage Control	159
Steel Control	160
Supplies Control	167
Timber Control	184
Transit Control	188
Transport Control	196

Crown Companies:

Aero Timber Products Limited	199
Allied War Supplies Corporation	199
Atlas Plant Extension Limited	201
Citadel Merchandising Co. Limited	202
Cutting Tools and Gauges Limited	203
Fairmont Company Limited	204
Federal Aircraft Limited	205
Machinery Service Limited	207
Melbourne Merchandising Limited	208
National Railways Munitions Limited	209
Park Steamship Company Limited	210
Plateau Company Limited	210
Polymer Corporation Limited	210
Research Enterprises Limited	211
Small Arms Limited	212
Toronto Shipbuilding Company Limited	213
Trafalgar Shipbuilding Co. Limited	213
Veneer Log Supply Limited	214
Victory Aircraft Limited	214
Wartime Housing Limited	215
Wartime Merchant Shipping Limited	216
Wartime Metals Corporation	218
War Supplies Limited	221

Index:

.....	222
-------	-----

ORGANIZATION

Defence Purchasing Board

Parliament in its first 1939 session passed the Defence Purchases, Profits Control, and Financing Act. This act, which came into force on July 14, 1939, created the Defence Purchasing Board which, subject to the approval of the Governor-in-Council, had the power to enter into all contracts for supplies and defence projects involving expenditures of over \$5,000. The authority to make contracts under the \$5,000 figure remained with the Department of National Defence.

The first meeting of the Board was held on July 18, 1939. The early purchasing staff came largely from the Canadian National Railways. The clerical staff was provided in part by the Civil Service, whilst others were engaged directly by the Board. Later additional purchasing agents were loaned by the Canadian Pacific Railway Company.

Following the outbreak of war, the powers of the Board were amended by order-in-council under the War Measures Act. Special powers were given to the chairman to make emergency purchases, the Board was empowered to enter into contracts for supplies and defence projects under \$5,000, and the contracts staff of the Department of National Defence was transferred to the Board.

War Supply Board

The War Supply Board was created by order-in-council on September 15, 1939. On November 1, 1939, the new Board assumed the duties of the Defence Purchasing Board.

The powers of the new board extended beyond those of its predecessor body and included the organization of industry for the prosecution of the war.

The powers given the Board required the approval of the Governor-in-Council for all contracts in excess of \$5,000. The procedure covering the awarding of contracts by tender was similar to that of the Defence Purchasing Board.

From time to time as the need arose, the powers of the Board were amended. Supplies and defence projects were defined in broader terms. The procedure of entering into contracts was laid down in more detail. The Board was placed under the Minister of Transport instead of the Minister of Finance. The purchasing routine was modified to meet existing needs. The powers of the Board in organizing industry were extended. The Board was empowered to act on behalf of the governments of the United Kingdom and of France.

Department of Munitions and Supply

The Department was created by the Department of Munitions and Supply Act, passed at the September, 1939, session of Parliament. A proclamation brought the Act into force at midnight on April 8-9, 1940. On the same day, the new Department was granted many of the powers of the War Supply Board. The procedure to be followed in making purchases and for the organization of industry was much the same as that of the Board. The new Department was authorized to take over the contracts entered into by the Defence Purchasing Board and the War Supply Board.

The Act also confers wide powers on the Department for the organization of industry, including the power to appoint Controllers for the administration of industry.

Supplies can be acquired and holders forced to accept fair and reasonable prices. The term "supply" has a wide interpretation and includes anything likely to be useful in the prosecution of the war and in the economic life of the country.

The Department has the power to require the production of documents, records, and accounts, and can generally take any steps to control or co-ordinate industry for the better prosecution of the war.

The powers granted the Department are thus such as to enable it to fulfil twin functions; namely, the making of all defence purchases, and the mobilization of industrial and other resources to meet war needs.

When the Department was launched, its work consisted chiefly in purchasing. But with the fall of France, the tempo of its operations rapidly increased, and

immense projects numbered in the hundreds, were also undertaken to create facilities for the production of munitions of every kind and type.

The vast increase in purchases which followed the fall of France, together with the extension and increased utilization of the industrial and other resources of the country necessitated a further mobilization and regulation of Canadian industry—a regulation which became increasingly necessary as factories came into production and the demand for raw materials mounted.

Controllers

With the increasing diversion of goods to war needs and the threat of shortages of supplies, Controllers were appointed to administer various industries and the supplies of various commodities. The powers of the Controllers, under the Department of Munitions and Supply Act and subsequent orders-in-council, are extensive. They can purchase, expropriate, manufacture, and take virtually any steps required to further the war effort in the fields in which they operate.

The Controllers, who are virtually the general managers of the industries they direct, were appointed on the following dates:

Timber Controller	June 24, 1940
Steel Controller	June 24, 1940
Oil Controller	June 28, 1940
Metals Controller	July 15, 1940
Machine Tools Controller	August 22, 1940
Power Controller	August 23, 1940
Ship Construction and Repair Controller..	November 27, 1940*
Motor Vehicle Controller	February 13, 1941
Construction Controller	August 26, 1941
Supplies Controller	August 19, 1941
Transit Controller	August 12, 1941
Chemicals Controller	July 10, 1941
Aircraft Controller	June 25, 1942
Rubber Controller	November 3, 1942

Note: The Transport Controller, although acting jointly with the foregoing as a member of the Wartime Industries Control Board, is attached to the Department of Transport. His control, which he exercises under that Department, covers railway facilities and the movements of all Government supplies; it includes priorities on vessels operating from Canadian ports and in Canadian waters.

*In April, 1941, the powers of the Controller of Ship Construction and Repair were amended and he became the Controller of Ship Repairs. In May, 1942, the powers of the Controller of Ship Repairs were again amended and he became the Controller of Ship Repairs and Salvage.

While the Controllors were appointed on these dates, in many instances some type of formal or informal control of industry was previously in effect. For example, in May, 1941, an order-in-council placed restrictions on construction for civilian purposes. The terms of the order-in-council were administered through the Priorities Branch of the Department.

Wartime Industries Control Board

In order to integrate the efforts of the individual Controllors, the Wartime Industries Control Board was formed on June 24, 1940. Every Controller upon his appointment automatically becomes a member of this board.

With the increasing war production, formal and informal steps were taken by the Controllors to arrange the necessary priorities. But in February, 1941, a Priorities Branch was created through which is handled all priority matters.

With the increased impact of the war on the economy, late in August, 1941, it became necessary to integrate more closely the work of the Wartime Prices and Trade Board and the work of the members of the Wartime Industries Control Board.

The Wartime Prices and Trade Board was given supreme authority in the field of price control, but the members of the Wartime Industries Control Board continued to be responsible for the supply and allocation of all materials essential for war needs.

The chairman of the Wartime Industries Control Board became a member of the Wartime Prices and Trade Board, and the chairman of the Wartime Prices and Trade Board is also a member of the Wartime Industries Control Board. Also, individual Controllors become problem members of the Wartime Prices and Trade Board when any action affecting their field of control is under discussion. In addition, virtually all the Controllors have been appointed Administrators under the Wartime Prices and Trade Board.

In order further to assure that steps taken by the Controllors are integrated with the measures of the

those of other Controllers and with other departments, all orders issued by Controllers must be approved by the chairman of the Wartime Industries Control Board.

The ever-increasing purchasing velocity of the Department, and its predecessor bodies, coupled with the wider sphere of its activities, is reflected in the following table showing the increase in its staff:

July 18, 1939	3
November 1, 1939	164
December 31, 1939	200
March 31, 1940	325
June 30, 1940	500
September 30, 1940	850
December 31, 1940	1,195
June 30, 1941	1,492
December 31, 1941	2,864
June 30, 1942	4,337
December 31, 1942	4,724

To obtain the production required, the Department has generally employed these three methods:

Direct purchases, generally by tender.

By creating industrial facilities, owned by the Crown but managed by private corporations.

By the creation of Crown companies to surmount special production problems.

Crown Companies

The Department today has created productive facilities amounting in all to some \$800 million and has incorporated twenty-three Crown companies. In addition to providing business men in the government service with a mechanism with which they are familiar, these Crown companies were organized to meet not only production problems, but also to surmount certain supply, purchasing, and administrative problems.

These companies operate directly under the Department and their accounts are audited by the Auditor General of Canada. The financial arrangements for their operations are submitted to and are approved by the Privy Council.

The activities of these Crown companies are reviewed elsewhere in this booklet.

PLANT EXPANSION

In general, the Department has employed the following three methods to provide additional plant facilities:

Private interests have financed their own plant extensions, with or without an allowance in the price for amortization of the new facilities.

Private interests have built plants writing off such expenditures through depreciation. Such deductible amounts are determined by a Government board created for this purpose — The War Contracts Depreciation Board.

Government funds (United Kingdom or Canada) have been provided for the erection of plants or plant extensions and the machinery and equipment therefor. The plants remain the property of the Crown, and in most instances, they are operated by private interests on a management fee basis, a fixed fee basis, or a fixed price basis. In some instances, methods of joint managerial control by the Government and private interests have been worked out.

The last of these three methods is that most commonly used by the Department to finance new plants, plant extensions, and the purchases of equipment. In addition, some of the Crown companies have provided facilities for the production of war matériel.

The fall of France threw on Canada the burden of expanding immediately its productive facilities. At the end of March, 1940, the Canadian and British governments had assumed capital commitments of some \$30 million for plant expansion. But by mid-year these commitments for the creation of productive facilities owned by the Crown had increased to some \$110 million with a further, immediately contemplated expenditure of \$50 million.

The following tabulation gives the approximate figures of capital commitments for plant expansion made by the Canadian and British governments through the Department of Munitions and Supply since the beginning of 1940:

Quarter	Millions of Dollars
March 31, 1940	30*
June 30, 1940	110
September 30, 1940	230
December 31, 1940	310
March 31, 1941	380
June 30, 1941	510
September 30, 1941	550
December 31, 1941	570
June 30, 1942	715
September 30, 1942	780
December 31, 1942	800

* Not included in this figure are certain commitments made by the United Kingdom Government through the United Kingdom Payments Office (originally the United Kingdom Technical Mission). Later, the administration of these expenditures was taken over by the Department of Munitions and Supply and they are incorporated in the later figures.

The percentage breakdown of fixed capital commitments by the United Kingdom and Canadian governments, as at September 30, 1942, by classes of products, is as follows:

	Per cent
Ammunition (including small arms ammunition)	17.3
Chemicals and explosives	21.2
Guns, mountings, and carriages (including small arms) ..	22.6
Machine tools, instruments, etc.	2.5
Mechanical transport	1.1
Raw materials, not end products, miscellaneous stores	17.1
Tanks and carriers	3.0
Aircraft	11.6
Shipbuilding and ship repairs	3.6
	<hr/> 100.0 <hr/>

As at September 30, 1942, the increase in fixed capital commitments over December 31, 1941, was approximately \$200 million. Little new expansion is in sight for 1943.

The foregoing figures include some millions of dollars expended to build up stockpiles of raw materials. In addition to these commitments, the Government has made available many millions of dollars to provide working capital for these projects.

During 1940 and most of 1941 United Kingdom commitments were substantially larger than Canadian, but the Canadian share of total commitments has been increasing and is now slightly over 60 per cent.

The largest proportion of these commitments has been expended and the plants are in operation.

PURCHASING ROUTINE

The purchases of the Department are made upon requisitions from the Department of National Defence and the United Nations. Depending upon the value and type of the commodities required, each requisition is signed by the designated authority.

Some of the requisitions involve much initial study and investigation. At times, preliminary enquiries must be made through trade channels. In other instances, means must be devised to provide Canadian manufacturers with the necessary raw materials. Orders are not placed abroad until every avenue for their domestic production has been explored.

Invitations to tender are sent to all firms known to be in a position to make reasonable tenders. These invitations are sent out by newspaper advertisements, by letter, by telegram, and sometimes by telephone. The method employed depends on the urgency and the type of contract involved. Not infrequently such invitations to tender go out to more than 100 firms.

As the bids are received an intricate routine is followed to assure that their contents and enclosures remain secret and unaltered until the date and time of opening. Tenders are then referred to the purchasing agent of the branch concerned to be tabulated and compared. Tenders which arrive after the expiry date are returned unopened.

The actual orders are placed on the authority of an official or officials of the Department. The various authorizations required for purchases may thus be summarized:

Contracts May Be Awarded to the Lowest Tenderer

- | | |
|-----------------------------|---|
| Up to \$2,000..... | After approval by the designated purchasing agents. |
| From \$2,000 to \$5,000.... | After approval by the purchasing agent and the head of the Purchasing Branch concerned. |
| From \$5,000 to \$15,000... | After approval by the purchasing agent, the head of the Purchasing Branch and the Deputy Minister. (Such contracts are subsequently reported to Privy Council). |

Over \$15,000.....After approval by the purchasing agent, the head of the Purchasing Branch, the Deputy Minister, the Minister, and Privy Council.

Contracts Awarded to Other than Lowest Tenderer

It is not always possible to award contracts to the lowest tenderer. In some instances the lowest tenderer is unable to deliver goods within the time required and in other instances the lowest tenderer is unable to meet the requirements of the specification. Such contracts may be awarded to other than the lowest tenderer, as follows:

Up to \$2,000.....After approval by the purchasing agent and the head of the Purchasing Branch concerned.

From \$2,000 to \$5,000....After approval by the purchasing agent, the head of the Purchasing Branch concerned and the Deputy Minister's Executive Assistant (Purchasing) who may refer the contract to the Deputy Minister for approval if considered necessary.

From \$5,000 to \$15,000...After approval by the purchasing agent, the head of the Purchasing Branch, and the Deputy Minister. (Such contracts are subsequently reported to Privy Council).

Over \$15,000.....After approval by the purchasing agent, the head of the Purchasing Branch concerned, the Deputy Minister, the Minister, and Privy Council.

The fundamental purchasing policy of the Department since its inception has been and still is based upon establishing prices by means of competitive bidding wherever possible. However, there are occasions when it is impossible or impracticable to obtain competitive tenders. In such instances a fair and reasonable price is established by means of Government audit.

In order to assure that the Crown is paying fair and reasonable prices for its purchases of munitions, at the present time close to 600 continuous audits are in progress, and in addition about 2,000 specific audits are under way. To date, approximately 7,000 specific audits have been completed. All these audits are carried out, not under the aegis of the Department of Munitions and Supply, but by officials acting on behalf of the Treasury.

All important contracts awarded contain a cessation of hostilities clause limiting the liability of the Government, but assuring the contractor of payment for work completed.

All contracts awarded contain clauses requiring that Government policies and enactments on labour conditions and wage rates be adhered to by contractors and sub-contractors.

STATISTICS

The following revised figures up to the end of the final quarter of 1942 cover two of the principal activities, namely purchasing and the provision of enlarged plant facilities, carried out by, or under the aegis of the Department of Munitions and Supply and its two predecessor bodies, the War Supply Board and the Defence Purchasing Board:

Total Contracts Awarded

Contracts placed, including plant extensions — Canadian account (x)	\$3,289,305,275
Contracts placed by Civil Aviation Division for airport construction under the Air Training Plan (x)	45,514,837
Contracts placed and commitments made on U.K. account for "stores"—and under the Plant Extension Program, together with orders for the output of these plants	2,711,764,280
Contracts placed—other account	496,317,278
Total contracts placed on Canadian, U.K., and other account, excluding certain contracts yet to be placed under the Plant Extension Program	\$6,542,902,324*

*This figure excludes letters of intention and unvalued acceptances of tender, which would substantially increase the total.

(x) Includes Contracts awarded under the Air Training Plan, some of which are chargeable to other Empire countries.

Number of Contracts—Canadian Account

Let by the Defence Purchasing Board and the War Supply Board, July 14, 1939, to April 8, 1940	11,136
Let by the Department of Munitions and Supply, April 9, 1940, to December 31, 1942	457,084
Total number of contracts awarded	468,220

The average number of contracts awarded per month during the past 36 months follows:

First quarter, 1940	1,902	contracts per month
Second quarter, 1940	4,054	contracts per month
Third quarter, 1940	8,343	contracts per month
Fourth quarter, 1940	8,770	contracts per month
First quarter, 1941	7,921	contracts per month
Second quarter, 1941	13,309	contracts per month
Third quarter, 1941	15,167	contracts per month
Fourth quarter, 1941	16,967	contracts per month
First quarter, 1942	16,375	contracts per month
Second quarter, 1942	19,944	contracts per month
Third quarter, 1942	21,386	contracts per month
Fourth quarter, 1942	20,462	contracts per month

Monthly Totals of Contracts—Canadian Account

The following tabulation covers the amended value of contracts by years for 1939, 1940, and 1941 and by months for 1942:

	Value of Contracts	Cumulative Value of Contracts
Total, 1939	\$ 64,720,319	\$ 64,720,319
Total, 1940	780,163,235	844,883,554
Total, 1941	1,197,212,675	2,042,096,229
1942		
January	81,223,945	2,123,320,174
February	112,622,685	2,235,942,859
March	57,241,238	2,293,184,097
April	103,832,605	2,397,016,702
May	90,872,213	2,487,888,915
June	112,611,969	2,600,500,884
July	113,221,185	2,713,722,069
August	129,823,200	2,843,545,269
September	114,943,940	2,958,489,209
October	124,523,277	3,083,012,486
November (a)	111,292,789	3,194,305,275
December (b)	95,000,000	3,289,305,275

(a) Preliminary figures.

(b) Estimated figures.

Commodity Classification of Contracts— Canadian Account

Total purchases on Canadian account from July 14, 1939, to December 31, 1942, are classified by commodity groups as follows:

Aircraft	\$ 477,495,574
Alloys and metals	15,747,082
Barrack services	5,917,892
Beds and bedding	28,783,702
Chemicals and explosives	12,477,554
Clothing	241,368,568
Construction and defence projects	338,582,294
Dockyard stores	19,823,193
Electrical equipment	100,805,467
Fire fighting equipment	7,390,194
Foodstuffs	98,204,144
Gasoline, oil and fuel	82,451,721
Hardware	5,115,051
Instruments	54,461,991
Kitchen and dining room equipment	12,008,819
Automotive transport	304,560,469
Lumber and building supplies	33,843,506

Machinery	28,640,593
Medical and dental stores	11,430,867
Munitions	113,539,052
Office furniture and equipment	5,270,833
Ordnance	339,352,860
Paints and paint supplies	3,294,995
Personal equipment	29,704,059
Photographic equipment	2,555,713
Sanitary supplies	5,429,448
Sh.pbuilding	548,399,324
Tentage and other canvas goods	3,940,485
Tools	10,503,955
Communications	3,262,467
Unclassified	8,501,275
Estimate of additional contracts not yet received	55,351,883
Total	<u>\$3,008,215,030</u>
Capital assistance contracts	<u>281,090,245</u>
Grand total	<u>\$3,289,305,275</u>

PRIORITIES

To determine the urgency of demands by Canadian industry for materials, equipment, and supplies from sources in Canada, the United Kingdom, and the United States, a priority system was established on February 20, 1941, under P.C. 1169.

As far as Canada is concerned, priorities are divided into three parts: Canadian Division, United Kingdom Division, and United States Division.

Canadian Division

Dealing only with materials and equipment of Canadian origin, the priority system in Canada operates on an informal or negotiation basis. When a Canadian company experiences difficulty in obtaining delivery of materials of entirely Canadian origin in sufficient time to meet war or essential civilian demands, it may submit its problem to the Canadian Division of the Priorities Branch of the Department. As the tempo of Canada's war effort increases, these requests for assistance grow in volume. Today, a small staff of men, well versed in Canadian sources of supply, is kept busy dealing with such problems.

Here is how the Canadian system works: A Canadian customer places an order with a Canadian firm for Canadian materials needed at a certain time to complete a contract or to continue a manufacturing or distribution process that is considered essential to the wartime economy. He finds that, owing to any one of a number of reasons, the order is not going to be filled. He then files a request, usually by letter, for assistance. A member of the Canadian Division of the Priorities Branch contacts the supplier and, if considered in order, the supplier is instructed to fill the order in question, giving it precedence, or "priority," over other orders that the supplier may have on his books. The essentiality of the order in relationship to the war program is, of course, taken into consideration. Despite the continued tightening of materials, it is still correct to say that, where such "essentiality" has been established, such requests are promptly cleared insofar as equipment and materials, wholly supplied from Canada, are concerned.

United Kingdom Division

The United Kingdom Division is responsible for the issuance of "Essentiality Certificates." These are certificates issued to Canadian firms after they have proven that a proposed shipment from the United Kingdom is essential to the war program and that the goods in question, or suitable substitutes, are not obtainable in Canada or in the United States.

In respect of a wide range of items, in short supply in the United Kingdom and/or the United States, and which come under the Lend-Lease agreement with the United States, the United Kingdom authorities require such an "Essentiality Certificate" before they will release materials and an export licence to the United Kingdom supplier. The issuance of an "Essentiality Certificate" is the responsibility of the Priorities Officer.

United States Division

Owing to the large quantities of supplies, materials, and equipment which Canada must import from the United States, it is very necessary that the system here be co-ordinated closely with that of the United States. The benefits of the fixed system of priorities that obtains

in the United States have been made available to Canada through the Hyde Park Agreement announced by President Roosevelt and Prime Minister MacKenzie King on April 20, 1941, and the Declaration of Policy by the Joint War Production Committee of Canada and the United States.

Under these arrangements, all present and future Preference Rating Orders and Preference Rating Certificates (the instruments of the U.S. priority system) may be made available to Canadian applicants on terms substantially equivalent to those upon which they are issued to United States applicants. (Canadian purchasers may not use such United States Preference Ratings to obtain, in the United States, materials which they can obtain in Canada).

In order to participate in the United States priorities system, Canada must have substantially the same restraints on the use of raw materials as those obtaining in the United States. This is accomplished by close co-operation between various Canadian Controllers and Administrators and the Priorities Branch.

In effect, therefore, Canada has the right to participate in the benefits of United States Preference Ratings providing action has been or will be taken by Canada to obtain similar results in the control of scarce materials and in the enforcement of regulatory measures.

To implement this policy, there has been established a Canadian Branch of the United States Division of Priorities Controls. This branch includes an Ottawa Section, located within the Department at Ottawa, and a Washington Section, located in the War Production Board, Washington.

In the United States Priorities System, the first control logically—although not historically—is the Limitation Control. There are two kinds of limitation controls now operating in the United States—the Limitation or “L” Order proper, and the Conservation Order, which is generally part of one of the “M” or Materials Orders. An example of this is the Copper Conservation Order.

The second type of control is the Preference Rating. In brief, a preference rating is a claim from a buyer against a seller, covering specific materials needed to produce certain end items. The ratings indicate the relative importance of the claim, but do not assure delivery unless there is enough to cover all higher ratings first. A preference rating, therefore, is only a ticket to stand in line, but does not guarantee the holder a seat in the theatre, if there is already a capacity crowd ahead of him. It should be noted, however, that additional control was exercised over the issuance of Preference Ratings in the fourth quarter of 1942, and every effort was made to relate the volume of preference ratings issued with materials and supplies available in the United States.

There are four important ways in which United States preference ratings are assigned. These all perform the same function, but each is designed to meet a specific problem.

1. Individual Preference Rating Certificates, PD-1A and PD-3A.

Individual preference rating certificates, known as PD-3A and PD-1A Certificates, are used for making specific applications for an individual order for materials or equipment of United States origin.

The PD-3A Certificate is used to assign preference ratings to individual navy, army, air force, and certain other governmental contracts.

The PD-1A certificate is used to assign ratings to any specific order for materials or equipment, of United States origin, not covered by a PD-3A certificate or a blanket rating. The ratings assigned by both the PD-3A and PD-1A certificate may be extended to suppliers and subcontractors for material physically incorporated in the end product, by endorsement of the purchase order as provided on these certificates.

2. Industry Blanket Ratings ("P" Orders).

Another important way in which United States Preference Ratings are assigned is by means of "Blanket Ratings" or what are commonly called "P" orders. This type of order is used when it has been decided that the

industry concerned is of such importance that all requirements within certain limits, laid down in the order, will be given a preference rating. Once the blanket rating has been assigned, it may be extended to cover needed materials in accordance with the terms of the particular order. Many of these "P" orders have been made available for Canadian participation. The most common of these "P" orders is the P-100 "Maintenance and Repair" Order.

3. Project Ratings.

Another way in which United States preference ratings are assigned is by a "Project Application for Preference Rating." This form of blanket rating is assigned to materials required for a particular construction job, which includes new construction, expansion, renovation, or alterations to existing facilities.

The ratings assigned apply to a specific list of materials set forth in the application which is made to the War Production Board in Washington, and these assigned ratings continue in effect until the project is completed. It should be emphasized that it is becoming increasingly difficult to have project applications rated in Washington, because of the growing shortage of materials, and the only basis on which they will presently be considered is that they have some direct connection with the war effort. For this reason, it is essential that persons contemplating new construction, expansion, renovation, or alterations of existing facilities should investigate the possibilities of getting priority assistance on materials of United States origin, before they begin work on any project involving such materials. It is quite possible that such an application for assistance will be denied and the applicant left with a partially completed project, if he has started work prior to making application for priority assistance.

4. Production Requirements Plan and Controlled Materials Plan.

For almost a year now, the chief instrument of Priorities control in the United States has been the Production Requirements Plan. At the present time, some 1,200 Canadian manufacturing units are operating

under this Plan and thus benefiting by the priority assistance extended by its use. The Production Requirements Plan is a blanket rating under which an individual manufacturing unit receives ratings covering requirements for specific amounts of materials for a period of three months in advance. The ratings assigned for the purchase of such materials are determined after a careful examination of the unit's past production schedule and its orders for future deliveries.

While the Production Requirements Plan has been the basic method by which Canadian manufacturers obtained priority for materials required from the United States, the adoption of what is called the Controlled Materials Plan is now in progress in the United States; it is expected that this new plan (CMP) will be in full operation by July 1, 1943. Adoption of the Controlled Materials Plan is a fundamental change in the operation of the United States Priority System; Canadian participation in its benefits is predicated on the ability of Canadian industry to prepare the necessary "requirements" statistics for the War Production Board in Washington.

The Controlled Materials Plan is a long-range plan for controlling the flow of critical materials into war production, one that has been considered for some time and which has now reached a point where it can be put into operation. Evolved from existing distribution systems and from experience gained through their operation, the Controlled Materials Plan is designed gradually to replace a substantial portion of the present priority system in the United States, including the Production Requirements Plan as it now exists.

The main purpose of the new plan is to assure that production schedules are adjusted within material supply so that production requirements are met. This will be accomplished by: (1) Adjusting requirements for materials to supply; and (2) Making the quantity and type of materials needed available at the time required to meet approved programs.

Allotments of critical materials will be made through "claimant agencies" such as the navy and army, to prime contractors producing essential goods. When

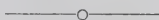
critical materials have been allotted to prime contractors producing such "end products," these prime contractors, in turn, will divide the allotments with their sub-contractors and suppliers. It will be seen that this is a "vertical" type of allotment, unlike the "horizontal" type of allotment found in the Production Requirements Plan, and one designed to assure that one part of a given contract does not get ahead of or behind another part.

Carbon and alloy steel, copper and aluminum—the three most basic and critical materials in the United States—are the first "controlled materials" to be directly allocated under the plan.

The Canadian allotment will probably be made in bulk and thereafter will require further allocation as between war supply and essential civilian needs in this country.

It has been determined in the United States, as a matter of policy, that the material requirements of the Canadian Government and of Canadian industrial concerns, from the United States, shall receive the same consideration accorded their own governmental and industrial requirements.

To assist the speeding up of the various kinds of "priority procedure," needed to effect delivery of vital war and essential civilian supply, regional offices of the Priorities Branch have now been established at strategic points across the Dominion. Offices are now in operation at Halifax, Montreal, Toronto, Hamilton, Winnipeg, and Vancouver. All priorities matters should first be taken up with the nearest regional office, rather than approaching Ottawa direct.



PRODUCTION

Introduction

Canada now ranks fourth among the United Nations as a producer of war supplies. Early in 1943 this output will reach a new peak with a rated annual capacity of \$3.7 billion.

The achievement of this position has meant an industrial revolution which will have profound effects upon the social, industrial, and economic life of the nation for generations to come. Great new industries have been created. Peacetime industries have been converted to wartime production. Labour and materials have been diverted from the non-essential to the vital. Peacetime facilities have been adapted to wartime needs. So sweeping has been this conversion that of all the thousands of Canadian industrial plants now turning out war supplies, only two were making exactly the same war products three years ago.

A fountain pen company makes shell primers. A sewing machine company makes ammunition boxes and fuses. A silverware manufacturer turns out smoke bombs and shell clips. A firm that once made electrical supplies now produces gun mountings. Streetcar and bus builders are making aircraft and guns. Locomotive works are making tanks.

Canada has chosen between bombs and butter, rifles and refrigerators, planes and pianos, tanks and taxis.

All this has meant dislocation. City streets are darker at night because humming war industries need electric power. Coffee is rationed because shipping space is needed for vital war materials. Cars vanish from the roads because planes need gas and army trucks need tires. Families migrate from old homes to new because war plants need workers. No town has been too small, no village too remote to escape the effects and evidences of the industrial transformation.

In view of the magnitude of the results, the scope of the conversion, the vast expansion of facilities, and the volume of the output achieved, it is remarkable that the changeover was effected without even greater shock

to established customs and methods. Even under normal conditions any corresponding revolution in the nation's industrial setup could be accomplished only over a long period of time and in the face of vast difficulties. Under conditions of war, however, working against clock and calendar, against world-wide dislocations of transport and material supply, the difficulties were far more complicated and overwhelming.

All problems have not been solved, all difficulties have not been overcome and new obstacles are constantly developing. But at the end of 1942, more than 4,000 Canadian manufacturing plants were turning out war products of all kinds, the nation's industrial capacity had been increased by a value of \$1 billion, and a million workers were engaged in war employment as against 300,000 in the early months of the war.

Before the war the Canadian aircraft industry employed less than 1,000 people and made only a few small single-engined planes and flying boats each year. In the 1939-40 period, Canadian aircraft production was just beginning its war program which reached a value of \$42 million. The following year it jumped to \$102 million. In 1942, despite a radical changeover to new types and a general expansion and stabilization of the program, aircraft production jumped to \$235 million from a coast-to-coast chain of strategically located plants covering seven million feet of floor space and employing more than 83,000 people. Canada now produces nine selected types of trainer and combat aircraft recognized as the best in the world in their respective classes.

Canada's peacetime automotive industry has been completely converted from passenger car and commercial truck production to the manufacture of military equipment of many types from armoured cars to ambulances. Empire armies in all parts of the world are dependent on Canada for mechanized vehicles. In the 1939-40 period the value of the Dominion's mechanical transport production was \$119 million. In the following year it was \$206 million. Last year the output was almost doubled at \$404 million. Since each unit requires approximately twice the labour and materials required

for a normal commercial vehicle, the present production rate would be equal to a twentyfold increase over the pre-war truck production.

A complete new heavy ordnance industry has been built up from scratch. Three years ago Canada had not the facilities for making a gun barrel, let alone a gun complete with mounting or carriage. By the end of 1942 Canadian ordnance shops were producing army and naval guns, carriages and mountings, at a monthly rate far ahead of the previous year's entire output. Parallel has been the development of facilities for making fire control instruments and intricate automatic equipment. Another new industry has been created in this field. Canadian-made equipment of this sort, much of it developed by the National Research Council, much of it highly secret, represents the most advanced scientific findings.

A vast small arms industry has been created. Great war plants are turning out Bren guns, rifles, Sten machine carbines, Browning machine guns, and other small arms at a rate of one a minute, 24 hours a day, seven days a week. November production of these weapons was 90 per cent greater than the output for all of 1941. Twelve types of small arms are being produced in Canada at a dollar value of more than \$50 million to date, and these weapons are being shipped to fighting fronts on every continent, involving more than 50 destinations.

The production of guns and small arms in the 1939-40 period, which was largely devoted to tooling up, was valued at a scant \$1 million. The enormous expansion in these fields is shown by the fact that production in 1941 was valued at \$22 million and jumped to \$186 million for 1942.

Still another huge wartime industry has been created for the production of ammunition and explosives. In the heavy ammunition field, where Canada is turning out millions of shells a year together with aerial bombs, land mines, naval mines, and grenades, the manufacture of components alone jumped from a 1939-40 value of \$14 million to an output of \$227 million in 1942. The manufacture of small arms ammunition has developed to the

point where Canada is now turning out 4,000 rounds of machine gun and rifle ammunition every minute. Canadian armour-piercing shot, made from low alloy steel at a quarter the cost of the high grade tool steel formerly used, has revolutionized this type of projectile. From a value of \$2 million in 1939-40, small arms ammunition production has expanded to a value of \$41 million for 1942.

The manufacture of filling for Canadian ammunition is another huge industry in itself, part of a chemicals and explosives output on a colossal scale. Canada produced no filled ammunition in the last war. The dollar value of chemicals and explosives produced and the ammunition filled in 1939-40 was about \$2 million. In 1941 it climbed to \$50 million. That production was more than doubled in 1942 to a total of \$121 million. The industry not only provides for Canada's needs in filling ammunition for shipment abroad but also for major requirements shipped to our Allies. Great projects representing an investment of \$140 million have sprung up in all parts of Canada to fulfill this program, one of the vital elements in the United Nations' plan. Certain vital explosives are being made in Canada at lower cost and in greater quantities than anywhere else in the world. The most powerful explosive yet made, a British discovery developed by Canadian chemical engineers, is only one of the scores of products coming from these new installations.

Armoured fighting vehicles were produced to a value of \$160 million in 1942, an output eight times that of the previous year. Instruments and communication equipment of very complex types were made in Canadian plants to a value of over \$80 million last year. And output of military stores, such as clothing, foodstuffs, fuel, and personal equipment for the Armed Services, accounted for a production value of \$390 million in 1942 against a quarter of that amount in 1939-40.

Canada is not only making vast supplies of munitions and equipment for her own services and for shipment overseas, but is also making a major contribution to the task of transporting those materials abroad. Although Canada had made no sea-going vessels in twenty years,

a shipbuilding industry of major proportions has been created. Cargo vessels and combat craft are being built in scores of tidewater and inland berths. More than 100 cargo vessels of 10,000 tons each have been launched and more than 300 naval craft, ranging from patrol boats to corvettes, have also slipped down the ways. Great ship repair facilities have been established to aid the Empire in the Battle of the Atlantic. Ship production and repairs have expanded from a dollar value of \$23 million in 1939-40 to \$274 million in 1942.

These programs have demanded great supplemental programs. Training schemes have fitted workers for new tasks. Housing developments have sprung up, airfields have been built, power installations constructed, steel mills have been expanded, metals developments have been undertaken. There has been great expansion in every field directly connected with producing munitions and supplies of war; correspondingly there have been natural and artificial restrictions on all non-essential industries.

The production program has been achieved against complex and inter-related problems of material shortages, manpower shortages, and machine tools shortages, all of which Canadian wartime industry has faced with vision and ingenuity. The increased production of steel is still inadequate to meet vastly expanded war production needs, and Canada must continue to import steel from the United States, where demand is also beyond supply. The output of nickel, aluminum, and copper falls short of the requirements of the United Nations, demanding rigid economy in the domestic use of those metals despite a greatly increased production.

Controls have effected regulation of the material situation. National Selective Service, training schemes, and the absorption of women into industry have been effective in combating manpower shortages. Establishment of a domestic machine tools industry has helped break the machine tools shortage. But during 1942 the situation was such that conservation was applied to war industries as a policy effective from top to bottom in order that the program might be continued on schedule.

This conservation program took various forms. Wherever possible critical materials were eliminated from manufacture of munitions and supplies. The redesign of many items of equipment was effected with a view to saving scarce materials going into such equipment. Simplifications were effected to save not only materials, but machine tool capacity and manpower as well. Advances in aircraft construction, for instance, permitted great savings in critical metals by the use of moulded plywood in designs of Canadian-made trainer planes in mass production. Throughout the range of wartime industry, a rough assembly of conservations effected on war orders up to October, 1942, revealed savings amounting to \$155 million annually, this figure representing thousands of tons of critical metals and materials, thousands of machine tools released for other purposes and thousands of manhours saved.

Although many conservations have been effected by simplifications of war equipment designs, improvements in shop practices and production techniques have had striking results. Not only have prime contractors and sub-contractors throughout war industry been asked to discover ways of saving materials, machines, and manpower for more efficient production but plant workers have also been enlisted in the war against waste. Labour-management committees and "suggestion box" systems, whereby workers are given awards for effective conservation suggestions, are extending the program throughout Canadian war industry.

Although conservation is dictated largely by shortages, there is another incentive. Under the system of fixed price and unit fee contracts, waste is definitely unprofitable. Conservation is classed under the heading of cost reduction.

The policy of the Department has been to use the profit motive and keep it within sensible and even narrow limits. It is felt that the cheapest production and the best control over profits are brought about by properly negotiated short-term contracts on a fixed price basis. On much new equipment, the practice has been to instruct

a contractor to make a number of articles at cost, the cost being subject to Government audit. After the cost audit is obtained, a unit price is determined, providing for a reasonable profit. The audited cost of the first run is frequently used as a target and a certain rate of profit is fixed on subsequent cost, as determined by audit, with the provision that a slightly higher profit may be allowed if costs are bettered, with lower profit if the target price is exceeded.

Cost audits are made by the Treasury, and are of a very thorough nature, involving inquiries into scrap losses, material costs and quantities, direct labour, and payroll analyses. Contracts can be revised retroactively or even cancelled if excessive profits are found and the Department has even taken over management of certain plants to obtain efficient management.

In many instances, the Government has provided manufacturers with new plant and equipment. Where a manufacturer can finance such expenditure himself the War Contracts Depreciation Board may provide for accelerated depreciation in whole or in part. If the contractor is unable to finance the expansion the Government provides machine tools, equipment, and buildings, retaining ownership as Crown property.

Two methods are followed in the operation of Government-owned plants—the Crown Company method or the management-fee system. Under the Crown Company set-up, a Government-owned corporation is formed to operate the plant for Government account. The president and directors of these companies are chosen for their particular knowledge of the operations and usually give their services without charge. Under the management-fee system the plant is operated by a private company which is paid a reasonable fee for its services.

Because the economies of the two countries are so largely interdependent, close co-ordination between the war production programs of Canada and the United States has been effected. Through the Joint War Production Board each country undertakes to produce the types of war equipment it is best able to produce and each

co-operates in providing the other with supplies. A Joint Materials Co-ordinating Committee of Canada and the United States arranges for production and allocation of the raw materials necessary for both programs. Both countries, of course, are members of the Combined Production and Resources Board which examines overall requirements and programs of the United Nations for the purpose of making the most efficient use of all Allied resources and production. Canada's war production program, therefore, fits intelligently into the North American picture and into the broad United Nations plan as a whole.

By comparison with war organizations of other countries, the Canadian system is relatively simple. It is headed up by the War Committee of the Cabinet, presided over by the Prime Minister, and comprising the Ministers of the three Armed Services, Finance, Munitions and Supply, Justice, and Transport. This Committee decides all matters of war policy. The Department of Munitions and Supply, acting on requisitions from the Ministers of the Armed Services, carries out all procurement for war. Requisitions are satisfied in the order determined by an inter-service Priority Committee. Materials and services are provided by the Controllers of the Department of Munitions and Supply and all war equipment production is arranged by appropriate Department production branches, functioning under a Co-ordinator of Production.

Under this effective and streamlined set-up, Canada wages war on the industrial front. In this fourth year of the conflict a million Canadian men and women are at work supplying the services, the raw materials, and the finished supplies and equipment that make up Canada's industrial contribution. Canada has proven its ability to plan largely and to produce with the best; in the smoke of countless factory chimneys may be discerned the shape of better things to come.

Ranging from the smallest pyrotechnics to heavy bombers, from shell fuses to infantry tanks, from rifles to heavy guns, some of the more important munitions now being produced in Canada may thus be summarized:

Ships:

Cargo boats, 2 types
Tankers
Minesweepers, 3 types
Corvettes
Motor torpedo boats
Patrol boats
Special service ships
Small boats, 41 types
Conversion of vessels to war needs
Boilers, generators, binnacles, and
general marine equipment.

Guns:

25-pounder field guns, with equipment,
trailers, and tractors
Bofors anti-aircraft gun barrels
Bofors anti-aircraft guns, mountings,
equipment, and predictors
3.7-inch anti-aircraft gun barrels
3.7-inch anti-aircraft guns complete
with equipment
Third type of large AA barrels
Tank guns and mountings
Anti-tank guns
Anti-tank gun carriages
2-inch trench mortars
3-inch trench mortars
Browning aircraft machine guns
No. 4 rifles
Browning tank type machine guns
4-inch smoke dischargers
Sten machine carbines
Boys anti-tank rifles
Bomb throwers
12-pounder naval guns
4-inch naval guns, 2 types
Naval pom-poms
Naval gun mountings, 12 types
Special gun parts
Naval Vickers guns

Ammunition:

Small arms ammunition, 22 types of
9 calibres
Shells, 28 types of 15 calibres
Cartridge cases, 14 types
Primer holders, 3 types
Fuses, 12 types
Gaines, 2 types
Primers, 6 types
Tracers
Accessories for fuses, 3 types
500-lb. bombs
Practice bombs
Depth charges, 2 types
Trench mortar bombs, 10 types
Rifle grenades, 4 types
Filled rounds of ammunition, bombs,
and depth charges.

Chemicals and Explosives:

Chemicals, 12 types
Explosives, 8 types
Pyrotechnics of 70 basic kinds for
aerial, field, naval, and practice uses

Aircraft:

Training planes, 4 types
Service planes, 4 types
Transport planes, 1 type
Link trainers

Tanks:

Cruiser tanks (Ram)
Infantry tanks (Valentine)

Vehicles:

Universal carriers
Wireless trucks, 5 types
Ambulances, 3 types
Field workshops, 21 types
Fire trucks, 3 types
Trailers, 19 types
Military tires of many types
Army mechanized transport, 90 types
on 12 different chassis
Reconnaissance cars
Scout cars
Armoured cars
Other fighting vehicles

Miscellaneous:

Armour plate
Clothing and boots for Navy, Air
Force, Women's Auxiliary Corps,
Air Cadets, and Naval Cadets Corps
Refugee and internment clothing
Personal equipment
Sighting and optical instruments, 37
types
Special military and naval instruments,
47 types
Binoculars, 2 types
Radiolocators
Wireless equipment for the three
services
Gas masks, 2 types
Steel helmets
Parachutes, 2 types
Towed targets
Flare parachutes
Signal type parachutes
Minesweeping gear, 3 types
Technical naval equipment
Life-saving apparatus
Searchlights, 10 types
Smoke generators, 8 types
Marine smoke floats
Hospital equipment and supplies
Dental equipment and supplies
Gas decontamination suits and
equipment
Military furniture and forms
Fire hose
Asbestos rescue suits and fire
smothering blankets
Steel ammunition boxes, 16 types
Wooden ammunition boxes and
containers
Machine tools, 4 general types in
hundreds of sizes
Gauges of many thousands of types
Cutting tools
Bren gun tripods
Anti-submarine equipment
100 round Bren magazines

In addition to creating the capacity to furnish these munitions, Canada has also expanded sharply its capacity to provide the raw materials required to feed its munitions plants, now the largest industrial effort in the Dominion. These raw materials and semi-finished products include brass, armour plate, magnesium, steel, alloy steel, optical glass, aluminum, base metals, and virtually all the raw materials available in this country suited to war purposes.

In addition to production, the Department has let some 3,700 contracts for construction projects involving an expenditure of some \$355 million. These figures include the erection of buildings for the navy, army, and air force, various defence projects, some new plants and plant extensions; but they do not include the cost of constructing nearly 200 airfields, housing facilities for workers, and the vast majority of the additional plant facilities which have been created by the Department.

Work is in progress, and in most instances far advanced, leading to the production of the following equipment:

Special gun parts	2 new types of service planes
New type AA mounting	5 more types of small arms ammunition
Secret equipment and weapons of various types	3 types of drill cartridge cases
Gun carriages	2 types of fuses
New waterproof type of steel ammunition boxes	Ground training bombs
	Rifle and hand smoke generators
	New type of anti-aircraft mounting

AIRCRAFT

Canada has scaled impressive heights in the realm of aviation since the day thirty-four years ago when a "heavier-than-air" machine flew for the first time over British Empire soil at Baddeck, N.S.

With fewer than 3,000 of what would now be called "stick and string" flying machines built during the Great War, however, the growth of the Dominion's aircraft industry has taken place largely since 1939.

When the Great War ended, the manufacture of military aircraft in Canada ceased. A civilian industry of

modest proportions developed, however, and at the outbreak of the present war eight aircraft companies were operating, together with one or two plants providing overhaul facilities. The total floor space occupied by the industry ran to 500,000 square feet; today, it spreads over seven million square feet.

The number of employees during the four years prior to the war averaged about 1,000. Today, employees number more than 83,000, of which 27 per cent are women. Apart from the natural war-time expansion, this increase in personnel arises from the larger production of service and advanced training craft, the manufacture of which requires from five to fifty times as many man-hours as primary trainers.

The following tabulation shows the growth of employment in aircraft manufacturing and overhaul plants in Canada:

December 31, 1939	4,948	December 31, 1941	37,379
December 31, 1940	15,802	March 31, 1942	43,720
March 31, 1941	23,643	June 30, 1942	47,970
June 30, 1941	26,197	September 30, 1942	66,979
September 30, 1941	30,795	December 31, 1942	83,665

Prior to this war, less than 40 aircraft were produced each year. During the nine months, September, 1939, to May, 1940, the industry turned out about 200 planes, most of which were elementary flying trainers.

With its current production now running to several hundred planes a month—the actual output varying with the intricacies of the types produced—Canada's aircraft industry now provides not only all the planes required for the vast Commonwealth Air Training Plan and most of the service planes needed for the defence of Canada, but is building an impressive array of first line combat planes for both Great Britain and the United States.

Although some plants are still in the tooling stage, the planes produced in Canada to date amount to 6,500, an output which includes service planes also numbered in four figures. They have been turned out by an industry which will produce during the next 18 months about a billion dollars' worth of aircraft for Canada and the United Nations.

To the layman, though, the most vivid evidence of the labours of aircraft workers lies in the fact that 130,000 rivets must be driven to build a single Bolingbroke, a plane which is far from the most intricate of those on which the plants are working; that more than 100,000 parts go into the construction of a giant Catalina flying boat.

To simplify and accelerate the output, the manufacture of aircraft in Canada is now confined to nine types, as compared with the 15 types which formerly were produced. These nine types are:

An elementary trainer, the Fairchild Cornell; a single-engined advanced trainer, the North American Harvard; a twin-engined advanced trainer, the Canadian Anson; a twin-engined reconnaissance bomber and bombing and gunnery trainer, the Bristol Bolingbroke; a coastal reconnaissance amphibian, the PBV-1 Catalina; a four-engined long-range bomber, the Lancaster; a navy dive-bomber, the Curtiss "Helldiver"; a twin-engined bomber, the Mosquito; and a single-engined transport, the Noorduyt Norseman.

Not included in the foregoing is the famous Hurricane fighter which is still in large-scale production in Canada but which is scheduled to "fade out" early in 1943.

Bearing in mind that a new type of aircraft must be chosen for production when it is in the blueprint stage, in order that it may be manufactured before it becomes obsolete, Canada is fortunate in having selected some of the war's most useful aircraft.

The PBV-1 Catalina flying boat is essentially a patrol craft. Costing close to \$250,000, it comprises more than 100,000 parts and requires in excess of 100,000 man-hours to produce. The Catalina weighs fourteen tons and its hull is as long as a Pullman coach. Its wing span is so great that ten automobiles could be lined end to end along the length of each. Holding the record for the greatest range of any twin-engined bomber in the world, it is propelled by Twin Wasp 1,200 h.p. engines, and constant speed propellers. It has gun pits in the nose and in the rear fuselage, and is provided with bomb or aerial torpedo installations.

The world's largest and fastest four-engined bomber, the Avro Lancaster has a speed of 300 m.p.h. and a range of approximately 3,000 miles. It carries a bomb load of eight tons and 10 Browning aircraft machine guns mounted on four power-driven turrets. Powered by four Rolls-Royce Merlin engines, it is 69 feet long with an over-all weight of 30 tons. Tooling is now approximately 75 per cent complete.

The contract for the Curtiss navy dive bomber, calling for the manufacture of more than 1,000 planes, was awarded in January, 1942, and involves an expenditure of \$60 million. Tooling is now 50 per cent complete. The "Helldiver" is the latest and best of the dive bombers.

With a wing span of more than 54 feet and a length of over 40 feet, the Mosquito bomber is powered by two Rolls-Royce Packard engines. It is made almost entirely of wood. Recognized as the world's fastest bomber, the Mosquito has an exceptionally long range, is extremely manoeuvrable and can be utilized on day or night operations; because of its great speed, it can also serve as a reconnaissance craft.

The Norseman is the only wholly Canadian-designed aircraft in the program. Easily the greatest and most adaptable single-engined transport in the world, it is equally efficient and manoeuvrable on wheels, skis, or floats.

All aircraft engines are imported. Otherwise, except for certain instruments, Canadian planes are Canadian made, and hundreds of companies throughout the Dominion are now turning out parts and equipment of one kind or another.

Among these are manufacturers of aircraft propeller blades and propellers. An aluminum plant capable of forging the largest propeller blades in the world is now in operation in Canada. Another factory turns out "constant speed propellers," which are made to such extreme tolerances that the final balance is tested by placing a very small cork on one blade close to the hub. The secret of the constant speed propeller is its adaptability to new and changing conditions. In other words,

the angle of its blades may be altered—as opposed to the fixed pitch propeller—to harness the full power of the plane's engine at all times.

Overhaul Program

The 10,000 planes now in service in Canada are being cared for constantly in some thirty special reconditioning plants of all types strategically located across the Dominion. Thousands of expert workers, both men and women, make use of their skill to assure that the craft will never falter in flight.

Aircraft overhaul is an intricate business. When a plane is delivered much more is required to maintain its mechanical perfection than a mere periodic inspection, a rapid check-up, or minor repairs speedily carried out. The plane actually has to be rebuilt after a specified number of hours of flight; it must be torn down completely and then reconstructed. Motors must be overhauled from two to three times as often as the airframe.

Keeping a plane in the air requires floor space, machinery, equipment, manpower, and a complex system of parts redistribution. All these facilities must be planned when the plane is first delivered. Canadian aircraft overhaul and repair supervisors must provide in advance all the needed spare parts and replacements, from an instrument dial to an engine or other major component. A week-to-week chart of its condition and performance is kept of each plane in operation. This system makes it possible to ascertain months in advance when a certain plane is scheduled for an engine overhaul or a complete airframe reconditioning.

In addition to its regular overhaul business, which includes the instruments and accessories which go to make a complete airframe, this industry handles the rebuilding of planes damaged by faulty operation or accidents. The overhaul of a single plane may run from \$1,500 to \$30,000 or more, the cost depending upon the complexity of the plane.

The overhaul industry also handles the assembly of crated aircraft which have been made elsewhere for use

in Canada. In addition, it carries out all modifications to aircraft, including changes in engine installation and the extensive alterations required to meet winter conditions in Canada.

AMMUNITION

To Canada, "pass the ammunition" is more than the name of a song. Ranging from the deadly 37 millimeter armour-piercing shot to the heavier shells in size, Canadian shells are today blasting the enemy on battle-fronts the world over.

During the Great War, shells were made in large quantities in the Dominion, but it was not until late in the conflict that the more difficult components and assemblies, such as fuses, were produced to any marked degree. Even at the outbreak of the present war, there were no facilities in Canada for the production of ammunition other than an arsenal in the Province of Quebec and two small pilot plants erected in 1937 and 1938 for the Department of National Defence and the British Government. Canada, therefore, had to rebuild its ammunition industry almost from the ground up.

Meanwhile, very marked technical improvements in both the forging and machining of shells have taken place. Modern forging and single-purpose machine tools are helping single operators to turn out six times their production during the last war.

As a result, Canada is today manufacturing well over a million shells each month, together with large quantities of aerial bombs, trench mortar bombs, and anti-tank mines. In addition, it has created a vast new industry whereby shells are filled with various explosives and shipped overseas as completed rounds of ammunition.

The impact of this vast program has been felt in other ways. Small peacetime arsenals have mushroomed over an area equivalent to that occupied by a fairly large

town. Foundries and machine shops have spread themselves similarly to meet the common need. Hundreds of plants manufacturing non-essential goods have been converted, rapidly and efficiently, to war production. Thousands of workers have been recruited from the ranks of labour and are now engaged in vital production. A growing force of women and girls has been trained to unfamiliar tasks. Mountains of raw materials, many of them coming from new or moribund native sources, have been amassed. A greatly augmented supply of machine tools has been accumulated.

Manufacturing capacity for certain basic materials essential to the ammunition program has been increased tenfold. Two Government-owned brass mills were put into operation during 1941 so that this metal would be produced at more than ten times the rate existing prior to the war. Tens of thousands of tons of steel are required per month, 40 per cent of which is made in Canada.

All told, there are nearly 50 plants engaged in making shells, and scores of others in producing the components of a round of ammunition. Aside from the expenditure of private capital to create ammunition production facilities, it is estimated that the Dominion has spent close to \$100 million in constructing plants for the production of ammunition, bombs, and mines, together with the facilities providing the raw materials for these plants.

The production of shells comprises 28 types of 15 different calibres. These include, among others, the 40-millimeter quick firing shell, the 25-pounder, the 3.7-inch anti-aircraft, the 4.5-inch howitzer, the 4-inch naval, the 75 millimeter armour-piercing shot, and the 2-inch naval.

In addition, Canadian factories are fashioning large quantities of shell components—12 types of fuses, 14 types of cartridge cases, two types of gaines, and six types of primers. There are also 500-pound aerial bombs, practice bombs, two types of depth charges, anti-tank mines, rifle grenades, pyrotechnics of 70 basic kinds for aerial, field, naval, and practice uses, 10 types of trench mortar bombs, and filled rounds of ammunition, bombs, and depth charges.

Despite the evolution of rapid, efficient mass production methods, the manufacture of shells, small arms ammunition, and bombs is not a job for unskilled hands.

The completed round of ammunition, for instance, has three main parts: the cartridge, which holds the propellant; the shell, loaded with TNT; and the fuse, either percussion or time, which detonates the shell. From a disc of yellow brass to the delicate thin cylinder ready for the charge of explosive 25 separate operations are required.

In one type of percussion fuse, there are 25 parts, each involving a number of distinct operations, and each operation, in turn, requiring precision and close scrutiny.

Originally, the Department of National Defence made most of its ammunition in the Dominion arsenals or bought it from the United Kingdom, but changing conditions resulted in the administration of this important phase of production being transferred to the Department of Munitions and Supply.

During the third quarter of 1940, the Canadian munitions program was again expanded. Orders for shell and ammunition components were virtually doubled. To handle the increased work in this and other armament fields, the Department created a new branch—the Munitions Production Branch.

As the pace of production continued to accelerate, it was found necessary in September, 1941, to decentralize the complex activities of this organization, and out of the Munitions Production Branch grew four new branches, among them the Ammunition Production Branch, which supervised the production of all ammunition, except that of small arms. The manufacture of guns has also fallen logically within the province of this branch, and it is now known as the Ammunition and Gun Production Branch.

Small Arms Ammunition

When Canada's troops stormed the beaches of Dieppe, it is probable that their rifles spat Made-in-Canada bullets at the enemy. Similarly, Dominion plants fed many of

the rapid firing aircraft machine guns used by the fighters which formed a protective umbrella above them.

In September, 1939, only one type of small arms service ammunition was being made in this country, although old equipment held over from the last war was being overhauled for production. From these small beginnings the Dominion's capacity for the production of small arms ammunition has undergone such a swift expansion that it is now an outstanding feature of the nation's munitions program.

Canada is now turning out more small arms ammunition in one working shift than pre-war facilities could have produced in two months. Covering a wide range of types and calibres, output is at the rate of nearly a billion and a half rounds a year or more than 60 rounds every second, day and night, the year round. The output represents a value of \$1 million a week. One month's peak production of one calibre alone would fill an ammunition belt long enough to reach from Halifax to Fort William.

Where 500 workers were once employed in one plant, now 30,000 workers in two Government arsenals and many factories being operated for the Government by private interests are turning out ammunition for the Bren gun, Sten carbine, Browning machine gun, No. 4 rifle, and Boys anti-tank rifle for the Armed Services of the United Nations. More than half the employees are women and girls.

Present capacities turn out 22 types of nine calibres, some of which are the ball, tracer, incendiary, and armour-piercing types of .303-inch, .30/06, .22 long, .38, .50, .55, nine millimeter, and .45 colt automatic.

Highlight of the 1942 program was the fact that the industry began to stand on its own feet in the matter of components. Until recently certain components had to be imported because the equipment was not available in Canada. Today even many of the machine tools required are actually being made in Canada while the rest are imported.

A new Canadian plant, which has just gone into the big-scale production of cores for armour-piercing bullets, is rated as one of the largest of its kind on the continent. Construction of this plant, equipped with batteries of automatic screw machines, now provides Canadian production facilities for cores which once had to be imported. Arsenal and plant facilities in general are of the most modern type.

Manufacturing difficulties are not restricted to the heavier shells. The .303-inch rifle or machine gun bullet, too, is a complex mechanism. Even with modern equipment and methods far superior to those employed in the last war, the manufacture of ball and flame tracer cartridges requires 99 and 116 operations respectively.

The production of small arms ammunition is supervised by the Arsenals and Small Arms Ammunition Branch of the Department. It administers the activities not only of Canada's arsenals but the operations of several privately-owned industrial firms engaged in turning out this type of war material.

The arsenals, operated previously by the Department of National Defence, passed into the control of the Department of Munitions and Supply on October 1, 1940, and the development of the production of all small arms ammunition in Canada has since been concentrated in this branch of the Department.



AUTOMOTIVE VEHICLES

Since the beginning of the war, more than 400,000 automotive vehicles have been produced in Canada and shipped abroad for service in every campaign in which Empire forces have participated.

Tens of thousands of Made-in-Canada cars, trucks, and armoured vehicles of every kind constantly ply the highways of Britain. The vehicles which went ashore with Canada's men on the beaches of Dieppe, except the

heavy tanks, were built by Canadian workmen. Additional tens of thousands are being employed successfully on the wasteland battlefield called the western desert.

The Canadian automobile industry, which even before the outbreak of hostilities had collaborated with army engineers in designing vehicles for military purposes, now extends over an area of more than five million square feet and employs in excess of 30,000 men. It builds more than 100 types of military vehicles, including 21 types of workshops, five types of wireless trucks, three types of ambulances, three types of fire trucks, Universal carriers, scout cars, reconnaissance cars, armoured cars, and 90 types of troop and ammunition transports, artillery tractors, and trailers.

Important among these products is the Universal carrier, in essence a baby tank. This efficient little machine travels at high speeds on caterpillar tracks, manoeuvres with ease on almost any terrain, and is equipped with machine guns. A single Canadian plant, the largest of its kind in the world, turns out enough of these carriers in a day to equip a battalion, enough in 14 days to equip an infantry division.

Canada is now producing approximately ten times as many trucks as she was at the outset of the war. With the entire output of the automotive factories devoted to war purposes, production is now at a maximum and has been maintained at this level for some months.

Canadian vehicles are rated very highly by all users, and within the range of tasks for which they are designed are considered preferable to any other make. The Germans admit their superiority and have ordered that when captured they are to be used for the more difficult tasks in preference to their own.

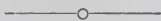
Less than 10 per cent of production is allotted to Canadian forces at home and abroad. The remaining 90 per cent is distributed to British forces overseas, including all the Empire forces of India, Australia, New Zealand, and South Africa. The Free French, the Poles, and other United Nations also use these Canadian

products. A substantial portion of the Dominion's Universal carrier production is going to the Soviet Union. While the over-all demand for Canadian vehicles exceeds the supply, the requirements of Canadian forces have been fully met.

Tanks

The Valentine, the tank that is being shipped to Russia in quantity, is a medium light tank. Powered by Diesel motors, the body is made of armour plate, riveted and bolted, and the rotating turret may be operated either by hand or by electric control. In reality, it is a giant mechanical ferret capable of burrowing its way through a brick building. As big as the living-room in an ordinary house, it is able to climb steep ascents, ford streams, and rip through barbed wire entanglements, or whatever ordinary defence works may be thrown up in its path. There are more than 40,000 parts, exclusive of armaments, in a single Canadian-built infantry tank.

Nearly twenty feet in length, the Ram tank weighs just as much as a railway freight car. It can proceed, lightly and quietly, over all kinds of terrain from swamps to rocky and irregular ground. Its Wright Whirlwind engine, which develops as much horsepower as several large, modern automobiles together, is capable of propelling its great bulk over obstacles and up steep hills. It is heavily armed with machine guns and a cannon capable of great offensive power.



CONSTRUCTION

Canada has always been a country of builders. The history of the construction industry is the history of the nation. In this war that industry has tackled and licked the biggest job it ever faced, a job which for the Armed Forces alone has involved an expenditure to date of more than \$355 million under some 3,700 contracts awarded by the Defence Projects Construction Branch of the Department.

This work, the dollar value of which exceeds the total for all construction throughout Canada in 1938, includes hangars for Canadian airports, buildings and ground services for flying schools, coast defence batteries, dry docks and ship repair facilities, and manufacturing plants.

The bulk of the construction work carried out to date has been for the Royal Canadian Air Force and the Combined Training Establishment. This includes some 2,000 buildings which are operated by a permanent staff of 83,000, exclusive of trainees. The hangars alone, placed side to side, would stretch for a distance of 26 miles.

Nearly 200 airports have been completed by the Air Service Branch of the Department of Transport, which now operates under the direction of the Minister of Munitions and Supply. These include a certain number which existed prior to the war and which have been improved and 18 airports for the Royal Air Force in connection with its training project in Canada. The Dominion is now one huge airport. And this is no exaggeration, because the paved runways of the Dominion's airports now equal a 12-foot paved highway from the Atlantic to the Pacific.

A large amount of work has been and is being carried out for the army. This includes the construction of training centres, coast defence batteries, ordnance buildings, army trade schools, barrack accommodation, mess halls, garages, extensions to small arms arsenals, field experimentation stations, and proof firing grounds.

The number of training centres built for the army totals nearly a hundred which, exclusive of office and administration buildings, comprise some 1,500 buildings.

For the naval services and ship repairs, important work has been done in the construction of dry docking facilities, marine railways and wharves, bases, barrack blocks, and mess halls. In addition, the construction of several naval training colleges was undertaken.

Exclusive of capital assistance granted by the Department for the construction of new plants and extensions

to existing facilities the Defence Projects Construction Branch has awarded contracts for some 65 projects at an estimated cost of more than \$50 million. These include large aircraft building plants, extensions to arsenals, to gun and tank plants, and buildings for research work in connection with the Armed Services. This work is almost 100 per cent complete.



EXPLOSIVES AND CHEMICALS

To provide the deadly firepower required in modern warfare, Canada has built, virtually from the grass up, a vast industry from whose plants pour a steady stream of explosives, chemicals, and filled ammunition. Today, 50,000 men and women are working in these plants which, if placed one with another, would blanket the city of Montreal.

The credit for this remarkable achievement—remarkable because of the rapid and efficient manner in which Canada's knowledge of chemicals and explosives has been harnessed to wartime requirements—belongs to science and industry, both of which collaborated in the expansion of this industry. It belongs also to the workers, the majority of whom have become skilled in operations which once were completely foreign to them.

Although several large explosives plants were built in Canada and operated from 1914 to 1918, none of these was maintained after the Great War. The equipment was used for other purposes or scrapped, and buildings were, almost without exception, torn down. Fortunately, however, the chemists had been working quietly during this twenty-year period; scientific research had not been allowed to lag. As a result, when war appeared imminent four years ago, Canada was in a position to put into immediate effect this accumulated store of knowledge.

Thus has Canada's explosives and chemicals industry developed. It has involved not only a capital expenditure of some \$140 million, but the construction of vast new plants, the manufacture of chemicals new to Canada, the employment of tens of thousands of men and women, and the creation of an entirely new industry whereby shells are filled with various explosives and shipped overseas as completed rounds of ammunition.

The full effects of this program are now being felt. Full scale production has been realized, the number of projects and the type of output has been revised upwards on several occasions, and Canada now supplies not only the requirements of domestic ammunition filling plants but large quantities for export to Great Britain, other parts of the Empire, and the United States. The present monthly production of chemicals and explosives runs into tens of thousands of tons.

Made-in-Canada explosives are the "punch" behind the millions of field, anti-aircraft, and anti-tank shells and hundreds of millions of rounds of small arms ammunition now streaming to all fronts. They are firing the depth charges to keep submarine wolfpacks at bay.

Canadian chemicals provide the smoke screens that protect British convoys and lighten the shepherding tasks of their fighter escorts. They go into the manufacture of more than 70 basic types of pyrotechnics now being turned out for the fighting men of the United Nations.

To direct the operation of this vast program, and to assure a steady flow of strategic materials to the plants, the Department of Munitions and Supply has established three individual agencies:

1. The Explosives and Chemical Branch, a branch of the Department, formed to organize in Canada the production of chemicals and explosives to obtain adequate technical advice on the supply of chemical products in Canada.

2. Allied War Supplies Corporation, a Crown company, incorporated to administer on behalf of the Canadian

and British governments the chemical and explosives plants which are owned and financed by the Government.

3. A Chemicals Controller, appointed to allocate chemicals for war purposes and to regulate the supply and distribution of chemicals in Canada.

The first large project undertaken in this new program, for the output of T.N.T. and cordite, began operation in Ontario in the autumn of 1940. Others have followed in steady sequence across the Dominion. All these undertakings are sizable, but more than one-half of them are major projects involving an expenditure of from \$1 million up to \$19 million.

The fact that a single ammunition filling plant occupies 450 separate buildings scattered over an area of more than 5,000 acres gives an idea of the magnitude of some of these projects. This plant operates its own railroad and fleet of trucks and provides living quarters for hundreds of employees. The plant has a recreational centre, a post office, a hospital, and a hotel.

Several other projects are of a similar size. Some are vast chemical works where the majority of the operations are hidden from the human eye, where invisible gas combines with invisible gas to produce an essential liquid, where may be seen only immense vats and towers which silently distil ingredients for deadly explosives.

Other projects are explosives factories where the propellant and bursting charges for ammunition are prepared. Some are larger than a moderately sized city and employ thousands of men and women. One of these is a project which turns out five different types of explosives, three of which had never been made in Canada before this plant began operations two years ago. Capital expenditure of this single project totals \$18 million.

The story behind a round of quick-firing artillery ammunition is perhaps best illustrative of the three phases of this industry—explosives, chemicals, and ammunition filling. The complete round looks much like an enlarged reproduction of a cartridge used in a sporting rifle. It consists of a brass cartridge case, in the base of which is a cap which explodes when it is crushed by a striker pin

or needle. This, in turn, flashes into gunpowder in the primer which ignites the cordite in the cartridge. When the cordite burns, it creates a terrific gas pressure which drives the shell out of the barrel. The shell is filled with T.N.T. or other high explosive and is fitted with a fuse which causes the high explosive to explode when the shell hits an object or at any desired time after it leaves the cannon.

The cordite propellant is a round, rod-like, taffy-coloured material which, in a closed space, burns rapidly and generates intense heat and large volumes of gas.

The story of cordite starts with the manufacture of ammonia which is oxidized to nitric acid. This acid is then mixed with sulphuric acid.

Next, glycerine is nitrated with the mixed acids to form nitroglycerine, itself a powerful and dangerous explosive. Meanwhile, wood pulp or wood cellulose is dipped in the nitrating acids and is turned into nitrocellulose or guncotton. The nitroglycerine and guncotton are then mixed in certain proportions in the presence of a solvent which dissolves the fibres of the guncotton and gelatinizes them. Various special chemicals are added to the mass which is then pressed into a cake. This passes through dies of fixed diameter, emerging as continuous cords which are cut by the operators to the desired specific lengths.

After being shipped in wooden boxes to the filling plant, the cordite is again cut to the required lengths—this time with extreme accuracy. Deft-fingered girls then tie it into bundles with tapes and sew it into fabric bags. To assure that the flash from the primer ignites the cordite evenly, an igniter pad is sewn to one end of the bag. This pad consists of two layers of special cloth between which is placed a layer of gunpowder. When the primer flashes, the flame penetrates the cloth, igniting the gunpowder. This, in turn, ignites the cordite and the flaming gases send another shell screaming to its mark.

The shell itself is usually filled with amatol or T.N.T. (trinitrotoluene). The latter is made by nitrating toluol,

a by-product of coke oven operation, with a mixture of sulphuric and nitric acids. After purification and processing, it appears as small yellow flakes. These may be melted into a liquid which when mechanically mixed with ammonium nitrate becomes amatol, a powerful but relatively safe explosive.

In the filling plants either pure T.N.T. or amatol is poured while still hot into the shell cavity. The first pour brings the level up to a certain point where it is measured and inspected to assure that no air spaces or bubbles are present. Then a mould is inserted and pure T.N.T. poured around it. When this solidifies, the mould is removed and examination reveals the shell to be completely filled with solid explosive except for the small recess left by the mould. Into this is introduced an exploder system of special compounds which will detonate the filling. The fuse hole is now sealed tightly with a nose plug.

Meanwhile, when complete rounds are being made, the filled cartridge cases and shells are brought together in the final assembly room. Shell and case are crimped together on a machine, and then the round is tested to make sure that it will fit snugly into the breech of the gun. Fuses and exploder systems are next screwed into place in the nose and the completed rounds packed in cylindrical cardboard tubes and then in steel or wooden cases for shipment.

The explosives plants themselves are characterized by widely separated buildings with thick barricades surrounding them to minimize the effect of an accidental explosion. These plants are divided into two areas. The "dirty" area constitutes those operations in which explosives are neither made nor handled. To go from the "dirty" area to the "clean" area, where the explosives work is done, workers must leave behind matches, lighters, shoes with metal nails, or any other exposed metal which might cause a spark. Women must remove silk, rayon, or other static generating material.

And so from inoffensive pulp wood and vegetable oils, from cotton, petroleum and coal, and from other products of the earth, is manufactured the high-grade

cellulose, glycerine, toluol, ammonia, phenol, and other chemicals. These are combined with other intermediates to produce the cordite, the T.N.T., the amatol, the fulminate of mercury, and the other explosives which are needed in increasing quantities. This is largely Canada's job. It is a huge job, but Canadian industrialists, scientists, and workers have taken it in their stride.

GENERAL PURCHASING

He weighed 160 when he joined the Army last year. In full battle dress he now tips the scales at 250. Yet, he has added only 14 pounds to his own weight. The remainder—76 pounds—is all clothing and equipment, clothing and equipment of the best possible quality, which he is taking overseas with him, and with which he will live for many months to come. This does not include replacements, just the accoutrements of a Canadian soldier.

In addition to his battle dress, his steel helmet, his gas mask, rifle, and bayonet, he carries a large haversack, web equipment, eating utensils, water bottle, ground sheet, greatcoat, cap, boots, socks, shirts, clasp knife, cartridge pouches, pay book, identity disc, and a number of minor items.

The task of providing him with the personal equipment required, exclusive of weapons, rests with the General Purchasing Branch of the Department of Munitions and Supply which also buys his food, his bed and blankets, and everything incidental to housing and caring for him—tables and chairs, kitchen and dining room supplies, lumber and building materials, office furniture, and equipment, sanitary supplies, household appliances, linen, electrical equipment, fuel, paint, hardware, religious and educational requisites, cultural and recreational facilities, and every essential of life. The Purchasing Branch handles this work for the entire navy, army, and air force, and also looks after some of the requirements of Great Britain, of other Empire countries, and of the United Nations.

Divided into 13 separate buying units, the branch employs a staff of 650, including personnel of district purchasing offices. Last year alone it issued orders for more than \$1 billion.

The work of building a purchasing organization began on July 21, 1939, when the Defence Purchasing Board first obtained the services of a purchasing agent of the Canadian National Railways who was seconded for the work. During August and early September, experienced purchasing agents were transferred from the Contracts Branch of the Department of National Defence, and, in addition, several purchasing agents were obtained from the staff of the Canadian National Railways and the Canadian Pacific Railway. By the middle of September, 1939, the purchasing division of the Board had expanded into five buying divisions.

When the War Supply Board superseded the Defence Purchasing Board, the rapidly increasing volume of purchases necessitated the re-allocation of much of the work and the creation of five additional purchasing divisions.

With the development of the purchasing technique, it became apparent that certain supplies, notably foods required by the Department of National Defence, could best be provided by local purchases to assure their rapid delivery to adjacent naval, military, or air force depots. Consequently, early in 1940 the War Supply Board established several local purchasing offices, many of which are operated by the Canadian National and Canadian Pacific Railways.

The Department of Munitions and Supply took over the duties and responsibilities of the War Supply Board in April, 1940, and the purchasing division, with its ten buying divisions, constituted virtually the entire Department. Since then, it has been substantially expanded, some of its divisions have become important branches, and new divisions have been created to meet the increasing demand for more supplies by the growing navy, army, and air force.

The General Purchasing Branch operates local purchasing offices in Halifax, Saint John, Quebec, Montreal, Ottawa, Kingston, Toronto, London, Winnipeg, Regina,

Calgary, Vancouver, Victoria, and Saint John's, Newfoundland. Added to these are two purchasing offices at the Dominion arsenals. It also operates four sub-offices at Halifax, Moncton, Montreal, and Toronto.

The General Purchasing Branch comprises 13 divisions: Textiles and uniforms; clothing and anti-gas equipment; automotive; barrack stores; lumber; commissary; electrical and radio; fuels; gas, oil and paint; machinery, tools and hardware; medical and dental supplies; miscellaneous militia and naval stores; chemicals and explosives.

The branch maintains its own "show room" adjoining its Ottawa administration offices where hundreds of pieces of clothing and other stores bought for the Armed Forces are displayed. This show room is being enlarged constantly and it will one day contain virtually all the personal and other equipment purchased for the services. The purpose of this display is to enable a manufacturer to see at a glance the store or stores which he is able to produce rapidly and economically.

The following statistics give some idea of the scope of purchases effected by the various divisions of the General Purchasing Branch.

Clothing

The two divisions responsible for clothing and textile purchases—Textiles and Uniforms, and Clothing and Anti-Gas Equipment—buy all the garments, shoes, boots, gas masks, and web equipment for the three services; wearing apparel for the women's auxiliary forces; internment clothing for prisoners; and even smocks for Government inspectors in certain Government-owned factories. Since July, 1939, they have placed orders amounting to more than \$292 million. Here is the breakdown in the dollar value of the contracts awarded by these divisions during the last two years:

	1941	1942	1943
Navy	\$ 3,700,000	\$ 7,430,000	6,918,487
Army	40,000,000	72,000,000	24,923,673
R.C.A.F.	25,000,000	31,000,000	5,199,369
Other account	8,300,000	25,300,000	3,741,812
	<u>\$77,000,000</u>	<u>\$135,730,000</u>	<u>57,156,955</u>

A + N

TEXTILES—The textiles buyers of the Department order all the cloth which is needed to manufacture uniforms, clothing, blankets, and other fabric items for the services, and this cloth is available to garment firms who are awarded contracts for clothing. This results in substantial savings to the Government. More than 50,000,000 yards of cloth were ordered during 1942, compared with more than 18,000,000 in 1941, 12,000,000 in 1940, and 2,000,000 in 1939.

UNIFORMS—The present production of battledress suits for the army, and air force uniforms, runs to more than 50,000 a week, compared with 32,000 a year ago. More than 1,000,000 battledress, and some 500,000 air force uniforms were turned out last year. The following figures give the numbers of items ordered and delivered during 1941 and 1942:

Jackets—Navy jumpers, army dress jackets, air force jackets, army battledress blouses, aircrew suits, army and air force drill jackets, and white duck jackets for the three services: 3,100,000 ordered, and 2,910,000 delivered in 1942, compared with 2,100,000 ordered, and 1,250,000 delivered in 1941.

Trousers—Navy trousers, army dress trousers, air force uniform and service trousers, army battledress trousers, drill and white duck trousers for the three forces: 3,260,000 ordered, and 3,670,000 delivered in 1942, including undelivered balance from 1941, as against 2,500,000 ordered, and 2,000,000 delivered in 1941.

Caps—Navy caps, army and air force field service caps, winter caps for the three services: 1942—1,325,000 ordered; 1,925,000 delivered; 1941—1,485,000 ordered; 835,000 delivered.

Winter Coats—Greatcoats for the three services, mackinaws for the air force, and duffel coats for the navy: 520,000 ordered, and 750,000 delivered, last year; 725,000 ordered, and 270,000 delivered in 1941. In addition, orders were placed in 1942 for 460,000 waterproof coats for the army and air force.

Boots and Shoes—The present production of boots and shoes for the Armed Forces is running at 85,000

pairs a week. The following figures include navy, army, and air force standard leather boots and shoes, army high leather boots, and canvas shoes for the services, but do not comprise the many orders and deliveries for special types of footwear, women's shoes, and others, issued by this division: 1942—3,660,000 pairs ordered, 2,550,000 delivered; 1941—925,000 ordered, 765,000 delivered. Of interest is an order for 21,000 pairs of shoes for motorcyclists. Overshoes and rubbers, standard types only, for men in the services: 1942—800,000 ordered, 836,000 delivered; 1941—200,000 ordered, 125,000 delivered.

Overalls—Combination overalls for the three services: 1942—1,040,000 ordered, 1,250,000 delivered; 1941—875,000 ordered, 675,000 delivered.

Shirts—Shirts of all types for the three services: 1942—2,390,000 ordered, 3,165,000 delivered; 1941—1,850,000 ordered, 1,475,000 delivered.

Underwear—Undershirts, woollen and cotton: 1942—2,965,000 ordered, 2,435,000 delivered; 1941—1,465,000 ordered, 1,675,000 delivered. Underdrawers: 1942—3,250,000 ordered, 2,800,000 delivered; 1941—1,230,000 ordered, 2,175,000 delivered.

Socks—Heavy and light: 1942 — 4,800,000 pairs ordered, 3,600,000 delivered; 1941—4,200,000 ordered, 2,735,000 delivered.

Gloves—Woollen and leather gloves and mitts for the three services, not including special types: 1942—2,100,000 ordered, 1,390,000 delivered; 1941—840,000 ordered, 645,000 delivered. Woollen comforter caps and mufflers for army and air force: 1942—325,000 ordered, 420,000 delivered; 1941—315,000 ordered, 120,000 delivered.

Blankets—More than 1,000,000 blankets were ordered, and 1,000,000 delivered in 1942, as against 1,380,000 ordered, and 875,000 delivered in 1941.

Special Equipment—Kitbags: 1942—675,000 ordered, 435,000 delivered; 1941 — 415,000 ordered; 360,000 delivered. Holdalls: 1942 — 460,000 ordered, 390,000 delivered; 1941—95,000 ordered; 125,000 delivered. Housewives: 1942—550,000 ordered; 250,000 delivered;

1941—140,000 ordered, 215,000 delivered. Sun helmets, army only: 1942—150,000 ordered, 250,000 delivered; 1941—250,000 ordered, 245,000 delivered. Orders for 12,222 tents were placed in 1942.

Anti-gas Equipment—This section of the Clothing Division issued close to \$12 million worth of orders in 1942, compared with about \$5 million in 1941. The following show the quantities of items ordered during both years:

	1941	1942
Aprons	2,000	3,000
Capes	273,000	960,000
Curtains	131,000	715,000
Gloves	416,000	375,000
Hoods	30,000	90,000
Jackets	75,000	160,000
Overboots (Pai.s)	172,000	75,000
Trousers	57,000	150,000
Wallets	125,000	500,000

Foodstuffs

The Commissary Division of the Purchasing Branch buys all the food consumed by the three services. During the past several months, in conjunction with the Department of National Defence, it has been conducting extensive research on the Canadian Army Mess Tin Ration, whereby with a small quantity of highly concentrated foods with a large calories and vitamin content contained in a box small enough to fit in the standard mess tin, soldiers may feed themselves for 24 hours. This unit is now in production.

The following statistics show the increases in the principal commodity purchases made by this division in 1942, as compared with 1941.

	1941	1942	1943
Meats	32,500 tons	50,000 tons	52,200
Vegetables	57,000 tons	80,000 tons	40,000
Bread	25,000 tons	33,000 tons	40,000
Butter	5,000 tons	7,000 tons	8,000
Eggs	5,800,000 dozen	8,500,000 dozen	19,496,098
Coffee and tea	1,600 tons	2,000 tons	23,000
Evaporated milk	6,000 tons	9,000 tons	11,000

Medical Supplies

This division buys all the medical, dental, and surgical requisites for the three services. Its purchases for 1942 topped those of 1941 by nearly \$2 million. Here is the dollar value of orders placed last year for certain com-

1,265,071

400,480
1,33,743
252,310
43,917
604,474
114,357
14,283

modities: drugs and chemicals, \$1,275,000; tablets, \$225,000; surgical dressings, \$935,000; rubber goods, \$270,000; apparatus, splints, and spectacles, \$443,000; surgical instruments and accessories, \$140,000; hospital furniture, \$110,000; field equipment, \$105,000; X-ray equipment, \$570,000; dental equipment, \$425,000; laboratory equipment, \$75,000; and physiotherapy apparatus, \$35,000.

Barrack Stores

Included in the wide range of purchases made by this division are altar sets, band instruments, bells, bowling balls, candles, carpets, corkscrews, five types of cleansers, fertilizers, all types of kitchen appliances such as dish-washing machines, meat choppers, potato peelers, cutters, sausage stuffing machines, and ranges; ink, furnaces, buckets, linoleums, boilers, sporting goods and gymnasium equipment, hand trucks, shovels, and ten types of soap.

2,610
27,147
44,350
156,000

Some of the 1942 purchases of this division: 1,250,000 plates, 1,000,000 bowls, 900,000 cups and mugs, 150,000 saucers, and 35,000 jugs; 2,500,000 knives, forks, and spoons; 55,000 pots, 90,000 pans, and 390,000 mess tins; 160,000 bedsteads, 400,000 mattresses, and 440,000 pillows; 7,500,000 brushes and brooms of all types, 145,000 pounds of paste floor wax, and 35,000 gallons of liquid floor wax.

During last summer, the Furniture and Office Equipment Division was subdivided into two units, one unit becoming the Lumber Division, the second being absorbed by the Barrack Stores Division which took on the purchasing of office equipment. Included in the items ordered for naval, army, and air force offices by the Barrack Stores Division and the former Furniture and Office Equipment Division during 1942, were some 20,000 office chairs, 550 bookcases, 450 desks, 750 office machines, and 6,500 typewriters.

Lumber

This division which replaces the Furniture and Office Equipment Division works in close co-operation with the Timber Control of the Wartime Industries Control

Tables 52,942 delivered
Chairs 120,074 "
Folding 32,243 "

Board. In 1942, contracts were let by this division for more than 95,000 folding and kitchen tables, close to 170,000 chairs, 12,000 dressing chests, and 350 settees, as well as for more than \$750,000 worth of lumber for the Armed Services, plus \$2,250,000 worth for Government-owned companies. # 8,684,712

Automotive Transport

To keep pace with the mechanization of the army, and the transport requirements of the navy and air force, this division purchases a wide variety of mobile equipment such as workshop lorries, laundry and disinfecting trucks, dental lorries, bicycles, motorcycles, snowmobiles, snow removal machinery, and more than 100 other types of vehicles. Dollar value of contracts let by this division during 1942 was in excess of \$750 million, compared with some \$200 million during the preceding year. # 102,554,075 ¹⁹⁴³

Fuels

In 1942, this division purchased more than \$10 million worth of fuels. More than 1,250,000 tons of coal, 25,000 tons of coke, and 50,000 cords of firewood were ordered during the year.

Gasoline, Oil, and Paint

This division issued orders for more than 100 million gallons of gasoline last year, in addition to 3,500,000 gallons of lubricating oils, thousands of gallons of paints, varnishes, and greases. The total dollar value of its purchases was in excess of \$40 million. 19 million (approx.)

Machinery, Tools, and Hardware

Another division which buys a wide range of equipment, the Machinery, Tools, and Hardware Division, increased its purchases in 1942 by approximately \$5 million over 1941. Included among its orders for machine tools were some 600 lathes, 700 grinders, 60 presses, 1,300 electric drills, and more than 300 items of woodworking machinery. This division also let contracts for more than 585,000 steel helmets, 500,000 feet of fire hose, and 70,000 fire extinguishers, as well as for thousands of dollars worth of mining and agricultural implements. More than \$20 million worth of orders were placed by this division last year.

Electrical and Radio

Included in the orders placed by this division during 1942 were 500⁴⁹¹ electric refrigerators, 700⁴²⁴ generators, more than 2,000^{2,000} miles of electrical wire and cable, \$6.5 million^{5,200,000} worth of wireless equipment, \$1.5 million^{1,500,000} worth of telephone equipment, and \$1,150,000^{1,150,000} worth of teletype equipment. The total dollar value of orders placed by the division in 1942 passed the \$65 million mark.¹¹³

Miscellaneous Militia and Naval Stores

Responsible for the purchase of a wide variety of equipment such as anti-submarine nets, mine-sweeping gear, photographic supplies, and other items, this division placed more than \$125 million^{115,000,000} worth of orders in 1942, including \$400,000^{394,000} for engines and engine parts, \$340,000^{340,000} for cordage, and \$1,750,000^{1,750,000} for navigation and other precision instruments. Other items of interest bought by this division last year were 5,200,000 feet (1,000 miles) of steel wire rope, 2,000^{300,000} buoys, 200 flotation barrels, and over 30,000 fathoms (36 miles) of link chain cable.^{18,000 (21)}

Among the many items not previously manufactured in the Dominion but which are now being supplied by Canadian industries are the following:

Tank Pump Fire Extinguisher
Ply-wood panels for folding boats
Anti-gas Clothing
Gas Masks
Camouflage netting
Wool Bunting for flags
Shell Filling Cloths
Parts for Aviators' Head Gear
Equipment
Bulkhead Glands
Naval Electrical Fittings

Upwards of 400 component parts of
Anti-submarine Secret Equipment
Water and Instrument Sterilizers
X-Ray Fracture accessories and
several surgical instruments
Bilge Pumps for naval vessels
Pulley Blocks for ships
Navigation Compasses
Anchors over 300 lbs.
Steel Helmets complete with linings
Wireless Sets for Tanks

GUNS AND SMALL ARMS

By building from scratch great capacities for the production of ordnance, Canada achieved a mass output of guns and small arms in 1942 on a constantly rising scale. In many instances, production records were established far ahead of planned schedules and all 1941 figures

were completely eclipsed. Production hit its stride to such an extent that toward the end of 1942 monthly ordnance output was greater than that for the entire previous year. On present programs, the peak production of guns and small arms should be reached early in 1943.

Canada produced one type of rifle during the last war, and turned out no heavy ordnance at all. In the field of gun production, not even a gun barrel had been made prior to September, 1939. Now, the Dominion is manufacturing field, naval, anti-aircraft, tank, and anti-tank guns of 12 types, as well as 16 types of carriages and mountings. This is heavy ordnance as distinguished from small arms. The total production of guns and small arms during the year was valued at \$186 million as against \$22 million in the previous year, but even this increase in dollar value fails to give the full picture of expanded output because costs have undergone substantial reductions with increased volume.

The heavy ordnance industry was built up in the face of special difficulties. The need for highly trained personnel was complicated by manpower shortages; metallurgical problems were aggravated by shortages of critical alloys and metals. The institution of training schools for workers has helped overcome personnel problems. Substitutions, such as malleable castings instead of steel, cast iron instead of bronze, have gone a long way toward breaking bottlenecks in certain operations.

Canada is now producing two types of heavy anti-aircraft guns, tank guns, anti-tank guns, four types of naval guns, a third type of heavy anti-aircraft gun barrel, and 25-pounder field guns, as well as carriages, trailers, and mountings.

The successful manufacture in Canada of heavy ordnance is regarded as a major achievement on the part of industry, an achievement which demanded the training of thousands of workers, the establishment of great assembly plants especially tooled for this type of production, and the conversion of scores of existing plants from peacetime output to the manufacture of various ordnance components.

Canadian production of the 25-pounder field gun, for instance, involves the services and equipment of 20 prime contractors and 139 sub-contracting firms. There are more than 1,800 parts, exclusive of nuts, bolts, and rivets, in the Bofors 40 MM anti-aircraft gun. Current production of the Bofors is 45 per cent in excess of the production for which the plant was designed, and a 70 per cent increase over original schedules is now in sight.

Anti-aircraft guns produced in Canada are the 3.7-inch and the Bofors, complete with mountings, equipment, and predictors. The 25-pounder field gun, of inestimable value to Empire forces on many battle fronts the world over, is delivered with equipment, trailers, and tractors. Naval guns include the 12-pounder and 4-inch types, as well as Vickers guns, and pom-poms. Canadian-built corvettes and merchant ships can thus be equipped with Canadian-made guns.

Overall figures covering the 1942 production of guns and small arms showed an increase of more than 900 per cent over the previous year. More than one-fifth of the entire British and Canadian investment in war plants has been allocated to the production of guns and small arms.

Small Arms

With eight major plants and scores of sub-contracting units operating on contracts valued at \$200 million, Canada is now turning out nearly 50,000 small arms a month. This immense output includes four types of machine guns, two types of trench mortars, Sten carbines, rifles, smoke dischargers, bomb throwers, and anti-tank rifles—12 types in all. Under United Nations requirements, which are dove-tailed and allocated by agreement, Canadian-made small arms have been shipped to fighting fronts on every continent, involving more than 50 destinations.

Small arms production in 1942 showed an increase of approximately 1,300 per cent over the previous year's output. In 1941 Canada produced Bren guns, .303 Browning aircraft machine guns, No. 4 army rifles, two-inch and three-inch trench mortars. During 1942, the list was enlarged by the addition of the Boys anti-tank rifle, the .30 Browning tank machine gun, the Sten

carbine, two-inch bomb throwers, four-inch smoke dischargers, and .22 training rifles. The first Canadian-made Vickers machine guns were also produced but have not yet gone into quantity production. In addition, there was also a very large output of spare machine gun barrels, Bren tripods, and 100-round Bren magazines, together with a full complement of maintenance spares, parts, and accessories for every gun.

The monthly production of Bren guns is now more than double that of 1941. Output of Sten carbines reached the original planned peak in August, 1942, when objectives were quadrupled. The new planned peak production of the Sten is now expected in March, 1943. So great has been the demand for the No. 4 army rifle, Canadian adaptation of the Lee-Enfield, that original schedules were doubled then redoubled.

One-third of the orders under the long-term overall small arms program have already been produced and most production is ahead of schedules which have been constantly revised and expanded. Deliveries on contracts for the Browning aircraft machine gun are so well ahead of the program that complete R.C.A.F. requirements have already been filled for 1943 and British needs are being so fully met that production schedules will soon be substantially reduced. This also holds true of the Boys anti-tank rifle, the output of which was scheduled to reach its peak early in 1943.

More than 25,000 workers are now employed in the eight major plants producing small arms in Canada. One plant alone, which is the largest small arms factory in the British Empire, employs 16,000. More than 60 per cent of the workers on the small arms program are women.

The shortage of skilled labour has been one of the principle production obstacles. Increased schedules have required more and more skilled toolmakers and machine-tool setup men, with few available, although training programs are gradually overcoming the shortage of workers.

Other obstacles have been bottlenecks in supplies of alloy steel, forgings, and seamless tubing but these have

been alleviated by careful analyses and substitutions of less critical materials. At a conservation exhibit in October, 1942, the small arms industry was able to show savings of \$6 million in critical materials, machine-tools, and manhours. These savings were effected by redesigns and substitutions under an effective conservation program. Further substantial savings are being effected every month, all tending toward lower costs. Total capital assistance to small arms companies amounts to approximately \$48 million.

SHIPS

A fleet corvette knifes through grey Atlantic waters as it streaks away from the serried ranks of a lumbering convoy of cargo vessels. The faint sound of an enemy submarine's diesel engines has been detected. Suddenly, depth charges, describing wide arcs in the fog-laden air, soar from the corvette's "Y" guns. From the depths arises the boom of muffled explosions, and presently the "all-clear" siren sounds. The convoy proceeds, bearing its precious burden of food and war matériel to Britain, to Russia, to Libya, to North Africa.

Many of these vessels, merchant and escort alike, are products of Canadian shipyards. Including engines and all equipment, they are more than 90 per cent Canadian content. They are a part of a vast ship construction program which now envisages an estimated expenditure of approximately \$900 million.

A task of this magnitude, which ranks the Dominion as one of the world's foremost shipbuilding nations, and which involves the construction of naval vessels, cargo ships, and a large variety of smaller craft, demanded not only the full use of existing shipyards, the majority of which had been virtually dormant since the Great War, but the rapid development of new ones.

How this major transition was accomplished is best told as follows:

By the end of the first quarter of 1940, contracts amounting to some \$50 million had been awarded. Today, total orders exceed \$900 million.

In the first quarter of 1940, only 4,000 men were employed on the shipbuilding program. Today, some 50,000 men and women are employed.

In the first quarter of 1940, fourteen major shipyards and fourteen small boatyards were engaged in the construction of naval vessels and small boats. Today 21 major shipyards and 58 smaller boatyards, located on the east and west coasts, the St. Lawrence River, and the Great Lakes, are building ships.

Since the beginning of the war, Canada has launched nearly 300 combat ships, including corvettes of a larger and faster type, minesweepers, patrol boats, base ships, and other craft. Progress is well advanced on the construction of two destroyers of the Tribal class, and scores of cargo vessels have been launched, many delivered. In addition, hundreds of smaller vessels, ranging from lifeboats to motor torpedo boats, have been built.

The swift, versatile corvette, which is essentially Canadian, is one of the most effective answers to the enemy submarine menace. The corvette escorts convoys, patrols coast lines, and fulfills the primary functions of a fighting ship—to seek out and destroy the enemy. The cost of a corvette is approximately \$700,000, and its construction requires some 375,000 man-hours.

Indicating the vast quantities of materials required for a naval shipbuilding program of this size, the construction of one minesweeper needs 300 tons of steel shapes and plates and 25 tons of rivets for the hull alone. There are 1,100 valves of various sizes; $2\frac{1}{2}$ miles of piping; 32 miles of electrical wiring; 26 tons of copper; and six tons of anchor chain. The time required to build such a boat is 350,000 man-hours. The electrical power generated by its reciprocating engines would be sufficient to supply a village of 1,200 people.

Cargo Vessels

Canada's steel cargo shipbuilding program, under which more than 300 merchant vessels of two types

will be built at a cost of approximately \$500 million, exceeds that of the last war by a wide margin, both in the number and deadweight tonnage of ships delivered and in the speed of construction. Wartime Merchant Shipping Limited, a Government-owned company incorporated to administer the program, has delivered more than 80 vessels, totalling more than 800,000 tons deadweight finally delivered, as compared with 63 ships, totalling 380,140 deadweight tons under the program started during the Great War and completed in 1920. Included in the program are 18 vessels of 4,700 tons.

One of these ships was delivered this year 88 days after the keel was laid. The fastest recorded time in the last war was 91 days for an 8,800-ton ship. Both records were made by Pacific Coast shipyards. Present launchings are at an average rate of one every two days.

With a deadweight of 10,000 tons, these ships are 416 feet in length, 56 feet in beam, and draw 25 feet of water. Powered by Made-in-Canada reciprocating engines and Scotch marine boilers, their manufacture requires over a mile of steel ship plate. Of the "North Sands" type, the ships have been specially designed to provide a maximum carrying capacity suitable for convoy work.

Here is the mixed cargo one ship can carry in one trip, stowed in the various holds and on deck:

Enough flour, cheese, bacon, ham, and canned and dried foods to feed 225,000 persons for one week; 2,150 tons of steel and other war metals in slabs and bars; enough carriers, trucks, and motorcycles to equip a full infantry division; enough bombs to load 950 medium bombers for attacks on western Germany or to load 225 heavy bombers for attacks on Berlin; enough lumber, plywood, wallboard, and nails to build 90 four-room cottages or a row of dwellings **nine blocks long; two** complete bombers stowed on the afterdeck and enough aluminum in the holds to build 310 medium bombers or 640 fighters.

Canada is giving to these vessels the names of forts renowned for their part in the Dominion's pioneer history. Fort Ville Marie, Fort Nipigon, and Fort

Louisburg recall early colonial battles. Fort Chambly still guards the rapids of the Richelieu River. Fort Churchill, Fort Qu'Appelle, and Fort Good Hope were centres of the fur trade. Some of the 4,700-ton deadweight vessels bear the names of army camps, such as Camp Valcartier, while others are named after national parks, such as Banff and Jasper.

Small Boats

The small boat program involves an expenditure of some \$13,000,000 and is now approximately 75 per cent complete. It includes crash boats, aircraft tenders, bomb-loading dinghies, salvage and supply boats, refuelling scows, flat scows, and derrick scows for the Royal Canadian Air Force; harbour utility craft, motor torpedo boats, gate vessels, whalers, pulling boats, and service dinghies for the Royal Canadian Navy; service boats and collapsible assault boats for the Canadian Army; battle practice targets for the British Admiralty; and rescue launches for the British Air Mission.

In addition, 90 yachts and motorboats have been purchased and 20 smaller craft have been chartered by the Shipbuilding Branch of the Department. The purchase of these vessels and the conversion of other ships for use in the transport of essential materials to theatres of war have absorbed another \$8,000,000.

One of the more interesting of the smaller craft is the collapsible assault boat. Twelve feet in length, this multiple purpose craft will carry a load of 2,000 pounds and still show a 10-inch freeboard. Its bottom is constructed of stiff plywood and its rigid laminated wooden gunwales are connected by collapsible canvas sides.

Ship Repair and Salvage

Extensive facilities for ship repairs have also been provided at an approximate cost of \$6 million. These facilities include a floating dry dock, new docking space, and additional machine shop buildings and tools for repair work.

General

To implement this program, two units of the Department and four Crown companies operate in close

co-operation. They are the Shipbuilding Branch ; the Ship Repairs and Salvage Control ; Wartime Merchant Shipping Limited ; Trafalgar Shipbuilding Company Limited, which arranges priorities for materials required in the program being carried out by the Shipbuilding Branch of the Department ; Toronto Shipbuilding Company Limited, which was formed to convert a Toronto shipbuilding property to Government use ; and Park Steamship Company Limited, which supervises and controls the operation of newly-built Canadian cargo vessels.



WARTIME INDUSTRIES CONTROL BOARD

In a pine and birch room with beaverboard walls, a room which boasts no gee-gaws or fancy trappings, nineteen men meet twice a month to iron out the wrinkles in their gigantic task of trying to find enough timber, enough rubber, enough steel, enough copper, enough power, enough of everything for the war program.

These nineteen men are at once builders and iconoclasts. Thanks in no small measure to their efforts, new mines have been put into operation, new power projects developed, new oil wells drilled, new docks built, new records achieved in the output of steel, aluminum and other raw materials, new alloys worked out, and scores of substitutes discovered.

But also owing to the efforts of these nineteen men in finding the raw materials for war production, hundreds of civilian products are no longer on dealers' shelves, some factories have been forced to close down, men have had to find new jobs and new homes, and in other ways business is no longer as usual.

These nineteen men comprise the Wartime Industries Control Board. Together with the Wartime Prices and Trade Board, with which they work in close harmony, they regulate the destinies of Canada's industries. The two bodies administer the control of everything from barber shops to buses, coffee to cadmium, sugar to silk, power to potatoes.

It is the function of each Controller on the Wartime Industries Control Board to try to meet the war demand for the goods or services under his jurisdiction. He must act both positively and negatively. He must spur the production of the goods or services he controls, and he must divert, wherever and whenever necessary, scarce materials or services from civilian to war uses. It is the function of the Board as a whole to see that the individual efforts of the Controllers fit into the complicated mosaic of industrial regulation which has become a wartime necessity.

As Canada approaches the peak of her war production, the demand for materials is outstripping the supply in almost every field. The shortages have become so grave that increased production of raw materials, plus rigid curtailment of civilian consumption, have not proved enough. During 1942 increasing emphasis was placed on substitutes and on the conservation of scarce materials in actual war production.

As the shortages have become more critical, the problems of control have become more complex. When one section of the economic hoseline is tightened, a bulge or leak may occur in another section. More constrictions have often meant more bulges to confine, more leaks to mend.

The Board, then, has an important job to do. Before the chairman approves a restrictive order proposed by one of the Controllers, the measure must be considered in these terms:

1. What will be the effect on the supply situation of the United Nations as a whole?
2. Will the order adversely affect the work of another Controller?
3. How will the order relate to the controls exercised by other Government Departments?
4. Does the order facilitate the most advantageous use of the material, or service, involved, from the standpoint of the war production program?

One of the important jobs of co-ordination which the Board must undertake is with the Wartime Prices and Trade Board. This co-ordination is made possible through inter-locking membership, and is furthered by the activities of a Departmental liaison officer, who is one of two Associate Co-ordinators of Controls appointed in November, 1942.

The inter-locking is achieved in this way: The chairman of each board is a full-fledged member of the other board. Eleven of the fourteen Controllers who operate under the Department of Munitions and Supply are also Administrators of the Wartime Prices and Trade Board.

The Controllers are pro tem members of that board when action affecting goods or services under their jurisdiction is being considered.

Broadly speaking, the Wartime Industries Control Board concerns itself with regulating industry so that a maximum of raw materials may be made available for efficient war production. To this end it is obviously desirable to effect the diversion before the materials are manufactured. There are exceptions to this, of course, in instances where control at the point of consumption is for various reasons necessary or preferable. Notable examples of such exceptions are the gasoline rationing system and the restriction on the purchase of rubber tires. By and large, however, the Board's control measures are expressed in terms of "no manufacturer shall make" rather than "no retailer shall sell" or "no individual shall buy."

The Wartime Prices and Trade Board takes on where the Wartime Industries Control Board leaves off. It controls prices, retail sales, and the production and distribution of all commodities not within the jurisdiction of the Wartime Industries Control Board. Between the controls of the two boards no "no man's land" exists.

If this broad definition of the functions of the two boards was true at the beginning of 1942, it is still more true today. When the Government first undertook the task of regulating civilian industries so that scarce materials might be channelled into war production, no hard and fast line could be drawn between what would be controlled by one body and what by the other. It happened, therefore, that late in 1941 the Wartime Industries Control Board, through the Controller of Supplies, decided to conserve steel and other materials by curtailing civilian manufacture of certain metal end products such as refrigerators, stoves, washing machines, and scores of other items. As the complexities of the dual control system became clarified in 1942 the necessity for adding to the list of such end products under the aegis of the Controller of Supplies no longer existed and, at the beginning of 1943, it was decided to turn over the control

of such civilian products to the Wartime Prices and Trade Board.

On the other hand, the control over rubber became so important to the whole war program, that it was deemed advisable in November, 1942, to establish a separate Rubber Control, and to head the Control with the official who, as Supplies Controller, had been in charge of rubber since the middle of 1941. At the same time this official also became Timber Controller, and the Chairman of the Wartime Industries Control Board assumed, in addition, the duties of Acting Controller of Supplies. These moves, effective on November 2, 1942, were made possible by P.C.'s 9993, 9994, 9995, and 9996 of November 3, 1942.

In the summer of 1942 the Government announced a policy of restriction of civilian industry to provide manpower for war purposes. It was indicated that the Wartime Prices and Trade Board would be responsible for putting the policy into effect. To co-operate with that Board and with the National Selective Service in regard to all labour matters affecting the Wartime Industries Control Board, one of the Associate Co-ordinators was given the duties of labour liaison officer.

The Wartime Industries Control Board was established by P.C. 2715 on June 24, 1940, and reorganized under P.C. 6835 on August 29, 1941. This latter order-in-council was amended by P.C. 7824 on October 8, 1941, by P.C. 753 on February 5, 1942, and by P.C. 831 on February 5, 1942. P.C. 831 fixed the penalties for infractions of any order of the Board, or of any Controller, at a maximum fine of \$5,000, or a maximum imprisonment of five years, or both.

Earlier in 1942, the Wartime Industries Control Board comprised 20 men, but after the re-arrangement of posts which accompanied the establishment of the Rubber Control, there were only 19. At the end of 1942, these were: The Chairman, who was also Co-ordinator of Controls; the Chairman of the Wartime Prices and Trade Board; the Co-ordinator of Production, the Financial Advisor, the Priorities Officer, Aircraft Controller, Chemicals Controller, Construction Controller, Machine

Tools Controller, Metals Controller, Motor Vehicle Controller, Oil Controller, Power Controller, Rubber Controller (the occupant of this post is also Timber Controller), Controller of Ship Repairs and Salvage, Steel Controller, Acting Controller of Supplies (the occupant of this post is also Chairman), Timber Controller (the occupant of this post is also Rubber Controller), Transit Controller, Transport Controller (see footnote), and the president of the Commodity Prices Stabilization Corporation which, like its parent body, the Wartime Prices and Trade Board, is under the Minister of Finance.

Because the Board usually makes effective its decisions through the orders of its Controllers, thus far it has required only two official orders of its own.

Order No. 1, of February 11, 1942, provided that any Canadian applicant for a United States preference rating order or certificate would be liable to the penalties provided for failing to comply with the terms of such preference order or certificate or for making a false statement or representation thereunder.

Order No. 2, of March 11, 1942, provided that no person who has obtained goods or services pursuant to an order of the Board, the Priorities Officer, or a Controller, shall use the goods or services except for the purposes stated in the order, for the purpose indicated by him in his representations to the official concerned. Any unused surplus of goods or services so released shall be reported to, and held subject to the further order of, the official concerned.

Note: To achieve co-ordination of effort in the solution of transportation problems, the Transport Controller, appointed as such by the Minister of Transport on November 15, 1939, was made a member of the Wartime Industries Control Board by the Minister of Munitions and Supply on April 23, 1942, under authority of P.C. 6835. His title "Controller" must not be confused with the similar title of members of the Department of Munitions and Supply who are controllers on the Wartime Industries Control Board; it is a title he possessed and acted under six months before the W.I.C.B. came into existence.

AIRCRAFT CONTROL

With the continued expansion of Canada's aircraft industry, the Aircraft Production Branch was faced early in 1942 with increasingly complex problems, most of which stemmed from the necessary policy of obtaining parts from many scores of sub-contractors scattered all across Canada.

The principal problem was to prevent these sub-contractors from introducing modifications without

regard to the effect in delaying production. In some instances changes, which in themselves seemed of minor significance when introduced without consideration of their effect on the whole program, would not only delay that particular part but would perhaps even tie up the entire airframe production line in the plant of one of the prime contractors.

To meet this situation, and the unauthorized use of Government-owned facilities for the repair of civilian aircraft, the Director-General of the Aircraft Production Branch, on June 25, 1942, under P.C. 5387, was also appointed Aircraft Controller, and thus became a member of the Wartime Industries Control Board. As Controller, he was granted jurisdiction over all Canadian facilities required in the manufacture, repair, and reconditioning of aircraft, aircraft parts, and gliders.

On September 25, 1942, A.C. 1 limited the manufacture or assembly of aircraft to the fulfilment of orders placed by the Dominion Government and of orders approved by the Controller. It provided that, except upon instructions of the Controller, no person shall introduce any modifications, changes, or additions into aircraft made for His Majesty. The order also provided that, except by permit, no repair or overhaul contractor, under contract with His Majesty to overhaul, repair, or recondition aircraft, may employ the facilities of the Dominion Government or the facilities ordinarily used for such purposes, for the repair or overhaul of aircraft not covered by the aforementioned contract.



CHEMICALS CONTROL

Long before Cagliostro tried to transmute lead into gold, men were seeking to dominate their fellows through the use of chemicals. But never have chemicals played so important a part in the destiny of the world as they do today.

On the white-smocked chemists of Canada rests much of the responsibility for the successful outcome of the war. Without them Canada's ammunition-filling program, on which the United Nations depend so largely, would not have been possible. Without them this country would not be producing plastics, paints, dopes, varnishes,

grease-removers, medicinal preparations, and thousands of other essential war items. Without them the prospect of "Made-in-Canada" substitutes for rubber would be merely a dream.

With the expectation that in 1943 great quantities of alcohol will be required for the explosives and synthetic rubber programs, a potential North American shortage was forestalled in October, 1942, when all distilleries were switched to the production of industrial alcohol. As a result no more spirituous liquors will be distilled until the war is over.

The necessity for such a move, or for any drastic control over chemicals, did not exist at the beginning of the war. Toward the middle of 1941, however, new munitions plants were rapidly coming into production, and Canada had embarked for the first time in her history on an extensive ammunition-filling program.

To assure adequate supplies, the appointment of a Chemicals Controller was authorized under P.C. 4996 on July 10, 1941. By the end of that year a Deputy Chemicals Controller was appointed. The Controller resigned in June, 1942, and the Director of the Explosives Division of Allied War Supplies Limited, a Crown company, left that post to become the new Chemicals Controller. His appointment, under P.C. 5915, took effect on July 13, 1942.

Since its inception the control has been broadening in scope until now it takes in more than 80 items ranging from quinine, dealt with in ounces, to soda ash and sulphuric acid, dealt with in hundreds of thousands of tons.

Broadly speaking, at the close of 1942 Canada was experiencing shortages of all chemicals and pharmaceuticals previously imported from the Far East, the West Indies, the United States, and the United Kingdom. Restrictions had been placed on alcohols, chlorine products, ingredients of various plastics, coal tar, toluol, non-edible molasses, quinine, glycerine, and other items. No civilian manufacturer was permitted any toluol.

Alcohol

Ethyl alcohol is probably older, in point of utility, than any other chemical known to man, yet by the same token it is as new as the latest big bomber. Great quantities will be used in 1943 in the making of synthetic

rubber. Together with acetone it is employed as a solvent in the manufacture of explosives. In addition, it is used as a warplane windshield de-icer, as an anti-freeze, and as a tincture in medicinal preparations.

Because of the difficulty of transporting molasses from the West Indies, certain distilleries late in 1942 were changing over their equipment to use wheat. After Canadian requirements of industrial alcohol have been filled, millions of gallons will be available for export to the United States.

On January 8, 1941, C.C. 7 provided that denatured alcohol may not be purchased from the manufacturer unless the purchaser is licenced; that no one other than the manufacturer may have in his possession more than 1½ times his normal supply.

On October 2, 1942, C.C. 14, effective November 1, provided that no producer may use or allocate his current production of alcohol for beverage purposes. The object of the order was to divert the entire output of Canadian distilleries to war purposes. It did not prohibit the sale of existing stocks of beverages, but sales and deliveries of alcohol 65 overproof or higher (industrial alcohol) could be made only under permits from the Controller.

Chlorine

If the Axis should resort to gas warfare, compounds of chlorine would be used to counteract the gas. Meanwhile, another chlorine compound is in use whenever the navy or army lays down a smoke screen.

Still another chlorine compound is indispensable in war production as a degreasing agent to clean metal parts during processing. In addition, chlorine is essential as a bleaching agent, as a germicide for civil as well as military water supplies, and as an ingredient in countless other chemical compounds necessary to the war effort.

Fortunately, a year before war broke out a large new chlorine plant had gone into production in the Province of Québec. By stepping up the rate of production in this and other Canadian plants, the output has been substantially increased. Despite this increase, restrictions on civilian consumption have been necessary to assure adequate supplies for North American war production.

On September 22, 1941, C.C.1 curtailed the use of chlorine as a bleaching agent in paper manufacture. Commencing October 1, 1941, no pulp or paper manufacturer was allowed to use more than 80 per cent of his consumption during the first six months of 1941 for bleaching rag stock. For making semi-bleached wood pulp, the corresponding quota was 70 per cent. The order also

set maximum brightness limits for bleached sulphite and sulphate pulp and for soda pulp, and for waste papers when used for conversion into bleached papers. Exempted from the order were high alpha dissolving and nitrating pulp and, upon application to the Controller, pulp in which chlorine is a processing rather than a bleaching chemical. Chlorine for bacteriological purposes was exempted.

On November 27, 1941, C.C. 1A revoked C.C. 1. Bringing the order into line with United States restrictions, it imposed stricter limitations on the use of chlorine as a bleaching agent in paper manufacture.

Glycerine

Normally in plentiful supply as a by-product from the manufacture of soap, glycerine in peacetime found a multitude of uses as a softener and hygroscopic (water absorbing) agent in such things as toothpaste, shaving cream, cosmetics, printing rollers, medicines, and certain foodstuffs. The quantity employed before the war in the making of dynamite was important, of course, but it was not until the manufacture of cordite began on a large scale that the total Canadian production of glycerine failed to keep pace.

Glycerine is invaluable to the war effort, not only as a base for most of the high-powered explosives, but in the manufacture of certain war plastics and as a medicinal base.

Late in 1941 the civilian use of glycerine as an anti-freeze was prohibited, and in February, 1942, civilian consumption was placed on a 40 per cent quota. Despite these restrictions and the achievement of a new high in production during 1942, the inventory position has grown worse. With the prospect of a restricted supply of fats and oils, from which glycerine is made, the output may drop in 1943, and further civilian restrictions may be imposed.

On September 30, 1941, C.C. 2A repealed C.C. 2, which had not been publicly announced. The new order curtailed the use of glycerine. The consumption and sale of refined or crude glycerine as anti-freeze, or for making anti-freeze, was prohibited. Except for explosives, sales and use of refined glycerine were reduced, effective October 1, 1941, to 70 per cent of the amount sold or distributed in 1940. The sale of crude glycerine was prohibited, except to persons designated by the Controller, and no person making refined or dynamite glycerine was allowed to sell, except under a Controller's permit. Similarly, exports of glycerine and imports of refined glycerine were placed under licence of the Minister of Trade and Commerce and the Minister of National Revenue, respectively.

On January 16, 1942, C.C. 2B reduced, as of February 1, the permitted consumption of, and dealing in, refined glycerine, other than for explosives, from 70 per cent (C.C. 2A) to 40 per cent of that used in 1940. Effective February 28, it prohibited the use of refined glycerine for making desiccated coconut, cakes, biscuits, confectionery including chewing gum, flavouring extracts and syrups, carbonated beverages, or any other food product.

Molasses

On January 9, 1942, C.C. 6-M defined non-edible final cane blackstrap molasses, high test molasses, and sugar beet molasses as "chemicals." These are used in making industrial alcohol and for cattle feed.

On May 8, 1942, C.C. 6 M-A defined hydrol (corn sugar molasses) as a "chemical."

Pitch and Pitch Coke

Pitch and pitch coke derived from coal tar are in great demand by the aluminum, ferro-alloy, and carborundum industries. Because the supply of Canadian coal tar is short of requirements, at the close of 1942 arrangements were being made for an increase in the imports of both tar and pitch.

On February 25, 1942, C.C. 9 prohibited dealing in and use of coal tar for road construction or repair, except under permit.

Plastics

From a scientific wedding of the chemical constituents of coal, air and water; from cow's milk; from limestone, natural gas, and salt; from wood and acetic acid or acetic anhydride; from carbolic acid urea and formaldehyde; and from various other sources, scores of plastics, many of them fresh from the magician's wand of the wartime chemist, are doing their bit in the fight for freedom.

Not only as substitutes for such scarce materials as metals, rubber, and silk, but also as a means for speeding up the production of complex shapes and parts, plastics are being used so extensively that some are now almost as scarce as the materials they are intended to replace. One example of this shortage is nylon. Instead of being used for women's stockings, it is being woven into parachutes.

Before they become periscope housings, warplane windshields, bullet tips, army badges and buttons, instrument panels, or any of tens of thousands of shapes, parts, and articles now made synthetically, most plastics are in powder form. Squeezed into moulds under tremendous pressure and at a high temperature, the powder undergoes great physical changes and emerges as the finished article or part. Instead of being a powder, some plastics are in liquid form, and their treatment differs somewhat.

An instance of the development of plastics is the manufacture of raincoats for Canada's Armed Forces from limestone, natural gas, and salt. By a process only recently perfected, the plastic powder is transformed into a polymerized vinyl resin, and this resin is dissolved into a suitable solvent, pigmented to give it the navy blue, khaki, or air force blue color, and plasticized to make it flexible. The coating composition is then applied to a cotton fabric and the material is ready to be used as waterproof sheeting or turned over to a tailor to be made into raincoats.

At the close of 1942 the plastic situation was this: The phenol-formaldehyde types, including bakelite, were in such short supply that they were available only for essential war purposes. The urea types were in only slightly better supply, and the cellulose acetates, although still available for certain civilian uses, were likely to come under tighter restriction in 1943.

On November 14, 1941, C.C. 3-M, a ministerial order, defined phenol-formaldehyde resin (bakelite), urea formaldehyde resin (a plastic similar to bakelite, not made in Canada), lacquers for aircraft, and other dopes, as chemicals subject to the Controller's orders.

On November 27, 1941, C.C. 4 revised the number of colours in which bakelite buttons may be made from more than 600 to only 15. Moulding compounds of the phenol-formaldehyde condensation type for special products involving chemical resistance were limited to two specified colours. This order covered bakelite used in products which were likely to come in contact with acids or with electric currents.

On February 3, 1942, C.C. 8 prohibited the use of bakelite or urea formaldehyde in the manufacture of radios, radio-phonograph combinations, or parts, except under permit.

On February 28, 1942, C.C. 10 established a Plastics Advisory Committee.

Quinine

A product of Java, quinine was used in peacetime as an ingredient of medicines, hair tonics, and other preparations. After its island source passed into enemy hands, Canada and the other Allied nations had to depend on available stockpiles. During 1942 the bulk of Canadian supplies was acquired by the Department of Munitions and Supply to be held in reserve for use by the Armed Forces as an anti-malarial agent.

On October 1, 1942, C.C. 15 prohibited the sale or delivery of quinine, or its use in making quinine compounds, except by physician's prescription or under permit of the Controller. The order did not prevent the use of quinine when it is indicated in the treatment of malaria.

Salicylates

Perhaps the most common of all medicinal preparations for the relief of pain and for the treatment of colds is acetylsalicylic acid ester, better known by the trade-mark name of "Aspirin." Under allocation in the United States, this drug has been placed under restriction in Canada, and as a result Canada is allowed a share of the U.S. production.

Soda Ash

Soda ash, known to the chemist as sodium carbonate and to the housewife as washing soda, is used as a water softener, as a flux in smelting, in the manufacture of aluminum, paper, soap, textiles, and glass, in oil refining, in the preparation of leather, and for hundreds of other purposes. With a stepping up of the production of glass containers to replace tin cans, and with a steady increase in aluminum production, soda ash is regarded as a wartime chemical, and hundreds of thousands of tons per year are being consumed. Until recently Canada imported large quantities from the United Kingdom. Now the necessary imports come from the United States.

Sulphuric Acid

One of England's most famous prime ministers, Disraeli, once remarked that the greatness of a nation could be measured in terms of its output of sulphuric acid. By this yardstick Canada has been growing in greatness.

During the first World War plants were erected for the manufacture of sulphuric acid, and production reached 50,000 tons a year in 1919. Later the plants were dismantled, but before the present war broke out Canada was producing the acid as a by-product in the smelting of nickel and zinc-lead ores. In addition two large plants have since been built as adjuncts to explosives works. By the end of 1942 the total output was several hundred thousand tons per year.

Immense quantities of sulphuric acid are being used in the processing of toluol, cellulose, glycerine, and other ingredients of explosives, and in most metallurgical operations. It is helping to feed Britain by the part it plays

in making fertilizer, and it is finding its way into thousands of war production processes.

Miscellaneous

On November 7, 1941, P.C. 8673 added 27 chemicals to the list of items which may be imported only under permit.

On December 4, 1941, C.C. 5 created a Dyestuff Advisory Committee.

On April 13, 1942, C.C. 11 prohibited the concentration, treatment, or disposal of spent lye except under the direction of the Controller.

On April 28, 1942, C.C. 12-M defined the following as "chemicals":

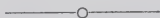
Natural gas, gums, resins, and balsams excepting those used in paint varnishes or other protective coatings generally referred to as varnish gums; synthetic gums and resins; crude drugs and their derivatives; aromatic chemicals and their essential oils whether natural or synthetic; dry colours and pigments; metallic soaps and dryers; albumens, including dried blood when for industrial use.

On June 24, 1942, C.C. 13M defined as a chemical any substance or mixture of substances which has a freezing point lower than 32 degrees Fahrenheit and which is commonly known as anti-freeze.

On June 27, 1942, C.C. 2C provided that, without a permit, no person may make or deal in ethylene glycol type anti-freeze except for orders of the Departments of Munitions and Supply and National Defence.

On July 9, 1942, P.C. 5915 appointed a new Chemicals Controller.

On October 20, 1942, C.C. 16 provided that from and after October 20, 1942, all persons using ammonium chloride in hot galvanizing operations shall recover all available sal ammoniac skimmings resulting from such operations and shall dispose of the same only under instructions of the Controller.



CONSTRUCTION CONTROL

The addition of lumber to the growing list of building materials in short supply has necessitated a further stiffening of the control over all types of construction in Canada.

Before the seriousness of the decline in timber production became apparent in the fall of 1942, the Construction Controller had virtually eliminated all non-essential building projects, and had severely restricted the use of scarce materials even for projects deemed essential to the war effort. In giving effect to such restrictions he was performing the function for which he was appointed: he was conserving the steel, copper, zinc, rubber, and other raw materials normally employed in civilian construction and now needed in the war program.

Under broadened powers, granted early in 1942, the Controller assumed jurisdiction in October over lower-cost construction projects which previously could be undertaken without a licence from his office. During the same month he issued another order under which it was no longer possible to employ some of the scarce materials which give a structure durability and fine appearance. The same order prevented the installation of more than one bathroom in a dwelling unit, and limited plumbing and electric and gas connections to the minimum essentials.

Still in effect at the end of 1942, this order placed the following restrictions on the cost of various types of construction which could be undertaken without a licence from the Controller:

For work of the following types costing over these limits a Construction Control licence is required:

Plant construction, repairs, additions, or alterations	\$2,500
Installation of equipment in plants	\$2,500
Where any building included in a plant project is to be used in whole or in part as a dwelling place, limit for such building..	\$ 500
Construction, repairs, additions, or alterations, or installation of equipment for buildings other than plants (including dwellings)	\$ 500
Grain elevators or grain storage warehouses in area west of Port Arthur and Fort William and east of the Rockies, construction or repairs	\$ 1
Installation of equipment in grain elevators or grain storage warehouses in Prairie area (as defined above)	\$ 500
Construction, repairs, or installation equipment for grain elevators or grain storage warehouses in all other areas of Canada ...	\$2,500
Conversion of gas or oil burning equipment to use of other fuels..	\$, 500

Under a subsequent order of the Timber Controller, worked out in collaboration with the Construction Controller, the sale of lumber and millwork for a wide range of construction projects costing less than the foregoing limitations was prohibited, except by permit from the Timber Control.

In line with his announced intention to discourage all building activities other than the erection of inexpensive housing accommodation in crowded areas, and construction essential to the war program, the Construction Controller made it a policy to refuse licences to those who might wish to build theatres, clubs, museums, libraries, funeral parlours, galleries, and many other civilian

structures. He decided he would permit the erection of such buildings as schools, temporary churches or church basements, hotels, halls, office buildings, or administrative buildings only in areas where such buildings have become necessary to provide for concentrations of the Armed Forces or war workers. He has confined apartment house construction to six and eight-family dwellings where that type of housing provides the cheapest form of accommodation. He has declined licences for stores, except for certain essential fire loss replacements, or where retail facilities are necessary for a military camp or war workers. On the other hand, except where public utility services are not available on immediate street frontages, he has granted licences for ordinary small homes, most of which cost an average of less than \$4,000.

On several occasions the Controller has emphasized that a licence from his office permitting construction work to commence, does not grant the holder any priority in obtaining scarce materials, nor does it over-ride restrictions imposed by other Controllers on the Wartime Industries Control Board or Administrators of the War-time Prices and Trade Board, or municipal building authorities. Towards the end of 1942, however, some thought was being given to the problem of priority assistance to private home builders in crowded areas.

The original order-in-council establishing Construction Control has been amended several times:

On May 16, 1941, P.C. 3481 placed the control under the Priorities Officer.

On May 21, 1941, P.C. 3634 authorized the Minister to amend the limitation as to value of construction allowed without a licence.

On June 17, 1941, P.C. 4320 exempted from licencing: Churches, public hospitals, educational institutions and projects financed or controlled by any province. (On January 30, 1942, these again came under control).

On August 26, 1941, P.C. 6656, placed the control under a Controller of Construction instead of the Priorities Officer, and appointed the Controller.

On January 30, 1942, P.C. 660 established broad new powers for the Controller. It provided that, except under licence, no person shall proceed with, or continue work on, any of the following projects:

(a) New construction of, or repair or alteration to, any building including the installation of any equipment, costing more than \$5,000 for any project.

(b) New construction of, or repairs or alterations to, any plant costing more than \$5,000.

(c) Installation of equipment or machinery in any plant, costing, including installation charges, more than \$5,000.

The order-in-council also empowered the Controller to reduce this \$5,000 limit, if in his opinion such a step became necessary.

Powers to control the production and use of construction materials, and to control construction material production facilities, were also given to the Controller, but on the understanding that in the event of these powers overlapping those of other Controllers, the orders of the other Controllers would govern.

The following orders have been issued by the Controller:

Order 1-M decreased the exempted amount for grain storage elevators.

Order 2 authorized a form of special licence for pulp and paper companies.

Order 3 clarified order 1-M in procedure of application.

Order 4 appointed an advisory committee for British Columbia.

Order 5 amended the special licence for the use of certain other industries.

Order 6-M cancelled 1-M and further reduced exemptions on grain storage warehouses.

Order 7 cancelled Order 3 and clarified Order 6-M.

Order 8 clarified previous orders to correct a legal technicality.

On April 2, 1942, Order No. 9 amended Orders 6-M and 7. It fixed maximum expenditures which could be made, without a licence from the Controller, on the construction, repair, or remodelling of a grain elevator or grain storage warehouse, other than that of a farmer.

In the area east of Fort William-Port Arthur this maximum was set at \$5,000.

In the area west of the Rocky Mountains the maximum was set at \$5,000.

In the area west of Fort William-Port Arthur and east of the Rocky Mountains, the maximum was set at \$1. In the same area no more than \$500 could be spent for installation of machinery or equipment, except by permit.

On April 2, 1942, Order No. 10 established a Grain Warehouse Construction Control Advisory Committee.

On April 27, 1942, the Controller moved his offices from Ottawa to Toronto. Early in 1943, the offices were moved back to Ottawa.

On June 27, 1942, Order No. 11 provided that no person may spend, without obtaining a licence from the Controller, more than \$2,500 for the conversion of his heating or power production facilities from oil or gas to coal or other fuel.

On September 22, 1942, Order No. 12 virtually banned all construction involving the use of higher grade materials. It prohibited the use of 19 types of building materials for constructing, repairing, altering, or adding to any civilian building, except a factory. It also prohibited the use of 14 types of scarce building materials for construction work on any munitions plant, factory, shipyard, or other building, regardless of its importance.

In general, the order provided that builders must be economical in their use of materials, and in addition to the two lists of classes of materials which may not be used, it prohibited the excessive use of less scarce materials in two corresponding lists.

As a result of the order, it will not be possible, until the war is over, to install two or more bathrooms in any dwelling unit, to build a steel fire escape, to roof a farm building with metal, or to employ some of the scarce materials which give a structure durability and fine appearance.

On October 9, 1942, Order No. 13 still further tightened the control over construction. Under the order the maximum cost of constructing, repairing, or altering a house, without a licence from the Construction Controller, was reduced from \$5,000 to \$500. For any such work on a plant the permissible maximum was cut from \$5,000 to \$2,500; on a grain storage warehouse, from \$5,000 to \$2,500, except on the Prairies, where it remained at \$1; and on any other type of building, including the cost of equipment to be installed, from \$5,000 to \$500.

The permissible maximum cost of the installation, without a licence of any equipment in a factory or plant was reduced from \$5,000 to \$2,500, and for any equipment, including construction work and installation, for the conversion of oil or gas to coal burning facilities the permissible maximum was reduced from \$2,500 to \$500.

MACHINE TOOLS CONTROL

While most Canadians are absorbed with war developments thousands of miles away, an industrial revolution is taking place on their own doorstep. Symbolic of that revolution, and a vital cog in its wheels, is the machine tools industry, which in less than three years has grown from a minor to major producer, and which now turns out certain special tools far superior to those made anywhere else in the world.

Prior to the war, Canada possessed only a comparatively small machine tools industry, and depended largely on imports from the United States and Great Britain. Today the domestic industry is supplying a great part of the needs of Canada, and by the use of certain surplus capacity a substantial number of tools have been shipped to Great Britain, other parts of the Empire, the United States, and Russia. A large number of single-purpose shell lathes have been exported to Britain and the United States, and general purpose machines to British Empire countries.

Under the direction of the Controller, the production of machine tools in Canada has grown rapidly, both in the number and diversity of the product. At the present time the following standard machine tools are being manufactured in this country:

- | | |
|------------------------------------|--|
| Engine lathes | xThread chasing machines for thread gauges |
| xCartridge case lathes | xGun boring machines |
| xPlain horizontal milling machines | xGun rifling machines |
| xProfile milling machines | xGun turning machines |
| xThread milling machines | Single-purpose shell machines |
| Drilling machines | xSingle-purpose bomb turning machines |
| Planers | Mechanical and hydraulic presses |
| Vertical slotters | xMany types of small arms ammunition machines from case and bullet jacket drawing to the inspection and gauging machines |
| Standard shapers | |
| xVertical shapers | |
| xContour profile grinders | |
| xCutter and tool grinders | |
| Bench and pedestal grinders | |

(x) These items were not manufactured in Canada prior to this war.

To gauge the measure of their achievement, something of the difficulty of making machine tools must be understood. What is a machine tool? What is its wartime role?

To the technician a machine tool is any power-driven machine, not portable by hand, the purpose of which is to cut metal by chipping. Whether it is employed for turning, boring, planing, milling, or grinding, or for combinations of any of these, such a machine falls into one of two classes. It is either an all-purpose or machine-shop tool, the famous "machine that makes machines," or it is a single-purpose or mass-production-line tool. It is thanks to the former class of machine tools that the war factories have been able to "tool up" for production; to the latter that billions of rounds of ammunition, hundreds of thousands of shells and armoured vehicles, and countless thousands of other war supplies are pouring from Canadian factories.

Whatever its class or type, the machine tool is a precision instrument which requires great skill and hundreds of man-hours in the making. The finished product may weigh only a few hundred pounds and be comparatively simple in design, or it may be a complex mechanism weighing several tons and containing as many as 3,000 parts. In either instance it must be made from iron and steel bars and plates which must be polished, fitted, and scraped.

A Crown company, known as Citadel Merchandising Co. Limited, was formed in June, 1940, for the procurement of machine tools needed by Canadian manufacturers, and, in order to provide proper control, a Machine Tools Controller was appointed on August 22, 1940, under P.C. 4101. He has the power to buy, acquire, distribute, sell, exchange, and generally deal in machine tools. He also has the right to take possession of any machine tools owned by corporations or individuals. He may fix maximum and minimum mark-ups, issue permits and licences, secure information, and generally exercise wide authority. It is the function of the Machine Tools Controller to assure that there is an ample supply of tools in the country, not only for present needs but to anticipate requirements for future developments, and to plan for the replacement of worn-out tools. The Controller also places tools in the plants of general engineering companies for the use of all production divisions of the Department of Munitions and Supply, since these divisions frequently

feel that, in the general interest, it is not expedient to requisition tools, on their own account, for some specific work.

After his appointment, the Machine Tools Controller made a survey of the entire machine tools situation in Canada. He obtained an inventory of all machinery and machine tools.

Plants having one or more identical tools operating on one shift were advised to operate two shifts and thus make available their equipment for other uses. Machine tools have been secured from non-essential plants and placed in essential industries where they have been urgently needed.

On November 20, 1940, by P.C. 6765, the Machine Tools Controller prohibited the production of new models of refrigerators, stoves, furnaces, washing machines, typewriters, and similar equipment which required re-tooling; applications could be made, however, to the Controller for slight alterations in design which would not require substantial changes in machinery.

In December, 1940, the Machine Tools Controller realized that the supply of cutting tools would become a vital problem if not dealt with at once. He therefore took in hand the establishment of adequate production capacity in Canada. Several plants were investigated and a large number of tools placed in them with a view to increased production. Canada is now self-sustaining with ample capacity of cutting tools to meet her needs; in fact, the Dominion may be able to assist Great Britain in the near future.

Preferences for machine tools are determined by the Controller, who works in close conjunction with Citadel Merchandising Co. Limited and assists that company in securing necessary data and information unobtainable by other means. As a result of a survey made early in 1941, in which the shortage of small tools was found to be serious, it was determined to extend existing plants and before mid-summer six cutting tool manufacturers were given capital assistance. Before the end of 1941, the situation was greatly improved.

To accelerate production the Controller instructed Canadian machine tool manufacturers in May, 1942, to confine their activities to certain types of machine tools.

In collaboration with the Used Goods Administrator, Wartime Prices and Trade Board, a price ceiling on used machine tools was fixed in the spring of 1942.

Early in 1942, at the suggestion of the Controller, a new Crown company, Machinery Service Limited, was set up in the Montreal area. The plant employs skilled refugees from enemy countries.

The Controller maintains a record of machine tools available for sale in Canada and of existing orders. Machine tools may not be exported except under licence and manufacturers have been advised not to accept orders for export, as the Canadian output is purchased by the Government-owned Citadel Merchandising Co. Limited.

Import permits are required for privately imported machines.

The Controller has kept in close touch with the machine tool situation in the United States. In the spring of 1942, the United States Government recognized the Controller's authority in Canada as similar to that being exercised by Washington over the production and use of machine tools in that country. His sanction is necessary for the release of United States machine tools to Canadian war industries under priority arrangements with the United States.

On March 25, 1942, M.T.C. 1 ordered that no person in Canada shall hereafter, except under a permit in writing issued by the Controller, buy or offer to buy any gauges or cutting tools that are to be supplied from any place outside of Canada.

On July 18, 1942, M.T.C. 1A prohibited, except under permit from the Machine Tools Controller, the purchase outside Canada of gauges or cutting tools.

On November 13, 1942, M.T.C. 2 provided that on and after November 15, 1942, without a permit from the Controller, no person shall place, and no producer or supplier of machine tools shall accept, any purchase order for machine tools calling for special electrical specifications. The order defined "Special Electrical Specification" as: (a) Any electrical apparatus not normally supplied by a producer or supplier of machine tools and not required by Specification C.22.2 No. 73 Electrically Operated Machine Tools, 1st Edition, December, 1941—Canadian Engineering Standards Association. (b) Any method of application to machine tools of any of the electrical apparatus defined in the foregoing.

METALS CONTROL

Although the output of Canadian mines in 1942 reached a peak hitherto unknown in history, and although Canada is now the largest metal exporting country in the world, Allied war demands are so great that virtually no metal of any kind may now be released except for direct and indirect war purposes of the greatest urgency.

With the expansion of the aluminum industry to a peak many times greater than that of pre-war days, with the development, within one year, of facilities for actual production of magnesium from dolomite, with the extension of recovery operations at large base metal mines, with the revival of old mines, the expansion of existing mines, and the exploitation of new properties, including marginal and sub-marginal deposits, 1942 will rank as one of the greatest years in Canadian metallurgical history.

To make this expansion possible an average of approximately 77,700 mine, smelter, and refinery workers were on the payroll in 1942, as against an average of 58,043 in 1939. But even with this increased payroll, a labour shortage existed and it was necessary to curtail to some extent the production of gold so that men might be released for base metal production.

Definite records of the annual value of metal and mineral production go back only to 1886. In that year the value of all mineral products was \$10,221,255, or \$2.23 per capita. In 1939 the total value of the country's mineral production was \$529,179,434, or \$46.33 per person. Since the war began the total has risen year by year and the likelihood is that in 1943 it will reach a new peak.

After the outbreak of hostilities the metal and mineral production of Canada was made available to the United Kingdom, and contracts provided for the annual shipment of more than one billion pounds of aluminum, copper, zinc, nickel, and lead. With the entry of the United States into the conflict, it became necessary further to increase production so that substantial quantities of exportable metals could be shipped to that country for its war program.

Actually Canada's output of certain metals is in excess of her own requirements. But because the metals situation must be looked at from the standpoint of the Allied nations as a whole, Canada must regard herself as in the same position as the other United Nations. She is, therefore, faced with shortages of most primary non-ferrous metals and all of the strategic minerals.

By the end of 1942, the most serious non-ferrous metal and mineral shortages in the following order were: Copper, tin, vanadium, tungsten, zinc, fluorspar, nickel, magnesium, aluminum.

In greater or lesser volume Canada produces all these metals, except vanadium, and in addition produces appreciable quantities of lead, platinum, silver, gold, mercury, asbestos, antimony, cadmium, arsenic, cobalt, bismuth, iron pyrites, graphite, sulphur, radium, molybdenum, ferro-alloys, manganese, mica, and other metals and minerals.

To spur production the Government has financed the development of deposits of critical minerals. In some instances the financing has been done by the Department of Munitions and Supply, in others by the United States Government's metal procurement agency, the Metals Reserve Company, in others by the Department of Mines and Resources, and in still others by a Crown company, Wartime Metals Corporation, which operates in collaboration with the Controller. In addition, millions of dollars have been spent on building up stockpiles of tin, tungsten, and other scarce metals.

Canada's mineral resources are far from illimitable. Already a toll has been taken of the known ore reserves, and it is now virtually impossible to discover and exploit quickly, any new sources of supply important enough to have a bearing on the outcome of the war. Marginal and sub-economic properties can, however, be tapped, and to this end the Controller, working with his Metals Advisory Committee, the experts on his own staff, and the Department of Mines and Resources, began in June, 1942, a rapid survey of the possibilities in that direction. At the same time he undertook strict control of all essential mines so that all possible metal may be extracted from

the ore, and so that available manpower and mine equipment may be utilized to the fullest extent.

One of the most notable achievements of the Metals Control has been the substitution of less scarce metals for those in shortest supply. Silver is being used very largely in solders and brazing alloys to replace tin. A newly developed silicon bronze is now replacing copper, zinc, and tin in many items, and a tin-free bronze is being used for the manufacture of gears.

But the most amazing achievements have been in the production of the light metals, magnesium, and aluminum. At the beginning of 1942 this country had to import magnesium; before the year was out a Government-owned plant, using a new Canadian process, was producing sufficient to provide for domestic needs and for the export of a substantial quantity. Aluminum production in Canada was not new, but its rapid expansion has rivalled that of any industry anywhere in the world.

The development of facilities for producing these two metals on a substantial scale will mean a revolution in the way of life for everyone after the war. From these metals lighter cars, lighter household appliances, lighter aircraft, and thousands of other articles will be made. Meanwhile, their production in quantity is lending wings to the defeat of the Axis powers.

On July 15, 1940, under P.C. 3187, the Metals Controller was appointed. His duties were to regulate the supply distribution, and use of non-ferrous metals, industrial minerals, and common metal alloys.

On October 4, 1941, under P.C. 7742, a Deputy Metals Controller was appointed.

On June 19, 1942, under P.C. 5225, these orders-in-council, P.C. 3187 and 7742, were rescinded, and the Metals Controller and Deputy Metals Controller were re-appointed with greatly broadened powers.

Immediately after he took office in 1940, the Controller restricted the domestic use of aluminum, nickel, zinc,

magnesium, tin, cadmium, copper, and brass. All these controls were later tightened.

In the fall of 1940 it was ordered that the export of all non-ferrous metals and common metal alloys, whether in ingot, semi-fabricated or scrap form, as well as all industrial minerals, requires a permit, which must be approved by the Metals Controller. Exports have been carefully scrutinized and applications for non-essential use have been refused or reduced.

In all instances the war needs of the United Kingdom and the United States have been given priority in the matter of exports. Except for war purposes the export of non-ferrous metal scrap is prohibited unless the scrap cannot be treated in Canada.

The men who head the Power Control and the Metals Control represent Canada on the Joint Materials Co-ordinating Committee which handles problems relating to the supply of war materials in the United States and Canada. Through this Committee, the Metals Controller has established liaison with the various agencies of the United States Government, such as the War Production Board, the Board of Economic Warfare, and the Metals Reserve Company. All war-purpose financial transactions between the two governments are executed by the Crown company of the Department of Munitions and Supply, War Supplies Limited, acting for Canada, and by agencies such as the Metals Reserve Company acting for the United States.

The Metals Controller is also Administrator of Non-Ferrous Metals (Primary) under authority of the Wartime Prices and Trade Board, in which capacity he exercises control over all non-ferrous metal prices and industrial practices which have been defined by the powers of that Board.

To assist the Controller and his Deputy, a staff of engineers, geologists, and consultants handles the administration of the Control under two operating divisions. One, the Development Division, regulates existing and projected metal and mineral production; the other, the Allocation and Conservation Division is responsible for finding substitutes for critical metals and for allocating

all available supplies whether from private or from Government-financed producers.

Aluminum

The aluminum industry in Canada provides what is possibly the most spectacular story of wartime expansion in any industry in any country. The Canadian output, increased many fold since war began, is now greater than the total 1939 production of the rest of the world, and is sufficient to supply about 40 per cent of the war requirements of the United Nations.

Yet the demands of the Allies are now so great—18,000 pounds are required for one large bomber, and thousands of bombers are needed to defeat the Axis—that civilian curtailments are likely to continue until the war is over.

Begun at Shawinigan Falls before the Boer War, a Canadian company supplied the trivial Canadian needs of that war and of the first world war. Today this same company operates a number of smelters in various localities and a plant, the largest in the world, which among them turn out millions of pounds instead of hundreds.

The principal requirements for the making of aluminum in Canada are bauxite from the tropics of South America, cryolite from the Arctic expanses of Greenland, acid-grade fluorspar from the United States, and electric power from the rivers of Quebec. At present about one-fifth of all the power generated in Canada is used in this one industry, and the industry itself has been responsible for the development of much of the power it consumes.

Back in 1899 and the early 1900's long-term contracts signed by the Aluminum Company of Canada, the sole Canadian aluminum producer, helped to create what is now a vast power network centering in the St. Maurice Valley in Quebec Province. About 16 years ago, the aluminum development was responsible for the huge hydro-electric plant at Ile Maligne which, with its installed capacity of 540,000 horsepower, was for a time

the largest single source of power in the world. A little over ten years ago the 260,000 horsepower development at Chûte à Caron was brought into operation. Until shortly before this war, most of the capacity of this latter plant was surplus, and used for industrial heating. Thus a reserve of a quarter of a million horsepower was available for increased aluminum production when the rumbling of this new war was first heard.

The war was not very old before this reserve power was put into active use, but the insatiable demand for more aluminum for aircraft, and for thousands of other war purposes, made new sources of power imperative. These sources of power were soon found, and the story of one, a project comparable in some respects to Boulder Dam (See Power Control) is in itself an amazing record of Canadian achievement.

The new Canadian aluminum facilities have not been confined to the making of ingots. New plants have been erected for the conversion of those ingots into alloy sheets, plates, castings, structural shapes, tubes, extrusions, and forgings. Canada is fabricating aluminum not only for her own war requirements, but also to satisfy many of the needs of her Allies.

In August, 1940, the Controller banned the use of aluminum for electrical conductors. At the same time manufacturers of aluminum cooking utensils and foil were advised that the supplies of primary aluminum would not be available for making those items.

Under the authority of the Metals Controller, the Aluminum Company of Canada fills war orders for primary metal, if a war order number is given. All other orders are referred to the Metals Controller who either approves or rejects them.

In July, 1941, control and curtailment were extended to secondary and scrap aluminum.

By the end of 1942, civilian consumption of aluminum in Canada had been reduced to one-fifteenth of one per cent.

The use of virgin aluminum as a deoxidizer has been eliminated in the production of shell steel, and other metals and chemicals are being substituted. For ordinary steel, deoxidizer low grade aluminum is now used in place of virgin aluminum.

The use of aluminum powder is being strictly rationed for essential needs, for purposes for which no substitute is practical.

Imports and exports of aluminum of all kinds are subject to direction of the Metals Control.

Antimony

Canada produces sufficient antimony for domestic consumption, and substantial quantities are being

exported to the United Kingdom. A by-product obtained from lead, zinc, and copper operations, it is used in various alloys, chiefly with lead, and is finding its way into many war materials.

Arsenic

Canada produces refined white arsenic. Four-fifths of the present output goes to the United Kingdom for war uses. At the same time this country imports from the United States all its requirements for insecticides.

Refined white arsenic is employed in the glass-making industry. It is used also as an alloying element, and as a component of many commercial chemicals.

Substantially increased production is in sight for 1943 from properties in Ontario and Quebec now being developed for the Metals Control. Two Quebec mines, which ship concentrates to an Ontario refinery, have been producing at capacity for some time.

Asbestos

The consumption of asbestos in Canada, the world's largest producer, is less than five per cent of the domestic output. At the end of 1942, about 90 per cent of the Allied requirements were being supplied by this country. Most of the exports were going to the United States, but substantial quantities also were being shipped to Britain. According to an estimate of the industry itself, more than 80 per cent of the Canadian production was being used for direct war purposes.

Asbestos is an essential in the making of clothing for fire fighting, for the covering of steam pipes, and for countless industrial processes which involve heat and the danger of fire. It is also important as a component of brake linings for jeeps and other military automotive equipment.

All exports of asbestos are under strict control.

Bismuth

Bismuth is produced in Canada as a by-product in the smelting and refining of lead and copper. The output is sufficient for domestic requirements and some is being exported to the United Kingdom.

In the manufacture of tin-free solders, as well as in other alloys, bismuth is an important war metal. It is also used in certain pharmaceuticals.

Cadmium

Early in the war Canada was producing five or six times as much cadmium as was needed in this country, but with tin in short supply new uses have been developed and more cadmium could be used. Meanwhile, however, the United Kingdom must be supplied and a large proportion of the Canadian output is being exported to that country.

The use of cadmium for plating has been restricted and the cadmium thus conserved is being added to the supply available for the replacement of tin in solders.

The Canadian cadmium supply comes from two companies, which produce it as a by-product in the smelting of zinc ores.

On May 30, 1942, M.C. 16 effective June 1, 1942, prohibited anyone from acquiring cadmium except by permit.

On December 23, 1942, M.C. 39 provided that no person would be permitted to use cadmium or any cadmium alloy for cadmium plating, except by permit. The order exempted the use of cadmium for plating component parts of aircraft, ships, radio communication apparatus, and fire control instruments. The Controller announced that he will not issue permits for cadmium plating of any of these articles:

Ammunition box hardware; screws; nails; rivets; nuts and bolts; wrenches; gauges; tools; pressure grease guns; tire irons; brake shoes; ski harness and ski pole tips; typewriters and other business machines; office machinery or supplies, including filing cabinets, files and filing trays; motor vehicle and trailer body parts and accessories; bicycles; all plumbing and heating equipment and accessories; lighting switches, lamps and associated fittings; all types of furniture, whether for institutional, office, or domestic use; all types of stretchers, hospital cots, and beds; and articles for any non-essential use.

Chrome Ore

Canada is producing only small amounts of chrome ore, but some relief from the shortage, as it affects war production, may be achieved in 1943. The Quebec property of Chromite Limited is in production under the management of the Department of Mines and Resources. The Chromeraine project at another Quebec location is being developed by Wartime Metals Corporation, and the company mill will treat customs ores from other properties in the area. Extensive exploration is under way in the Bird River area of Manitoba and Ontario, and test shipments of the material are being sent to metallurgical

laboratories. Chrome formerly came from South Africa, the Philippines, New Caledonia, India, and Turkey, and the bulk of Canada's needs must still be imported.

Chrome ore is used principally in the production of ferro alloys and basic refractories. It is important in such essential war needs as gun steel, armour plate, and stainless steel.

Cobalt

Canada is a large producer of cobalt. Domestic ores or concentrates, containing eight per cent or more of cobalt and up to 500 ounces of silver per ton, are being purchased on U.S. Government account, and are being stockpiled at Deloro Smelting and Refining Company plant in Ontario. The producers are paid for the cobalt and on the silver content of the ore at the prevailing United States price for silver.

In recent years, most of the cobalt production has been from imported residues, originating in Africa as the by-product of copper refining. Present stocks of those residues in Canada are fairly large.

Pure cobalt is a silvery, whitish metal resembling nickel, but as an oxide it is an ingredient of the brilliant blue pigment named after the metal. In combination with chromium and tungsten it is used for high-speed steel alloys, and thus finds its way into countless war production tools, and into some war supplies.

Copper, Brass and Bronze

At the beginning of 1943 the over-all United Nations shortage of copper was still the most critical of the major metal items.

Even though the war program of the United States had not reached its productive peak, the deficit in the copper supply was already serious as far back as the spring of 1942. One Canadian example of the wartime demand which brought about this shortage is the increase in the consumption of the brasses. The production of those alloys, which are largely copper, has risen by more than 1,000 per cent, and is likely to rise by an additional 500 per cent.

Less than one-third of one per cent of the copper mined in Canada is now being used for purposes which are not directly or indirectly associated with the war program.

Of the wrought copper and brass produced in Canada more than 98 per cent is being used for the manufacture in this country of shells, warplanes, ships, guns, tanks, and other war supplies. Less than one per cent now goes into essential civilian uses, and the small balance is divided between exports and non-essential uses. Of the copper wire being manufactured in Canada, 53 per cent is being used for direct war purposes in this country, 45.5 per cent for essential civilian purposes, eight-tenths of one per cent for exports, and seven-tenths of one per cent for non-essentials. The demand for copper wire rose sharply at the beginning of January, 1943, after a severe storm did extensive damage to communication lines in Quebec and Ontario.

Late in 1942, efforts were being made by the Metals Controller, on behalf of the Metals Reserve Corporation, the United States Government metal procurement agency, for the development of marginal and sub-marginal properties in Canada.

The control over copper began informally, but by the end of 1942 it was on a strict allocation basis.

The regulation of brass and copper was begun in July, 1941, through the surveillance of export licences and through informal understanding with principal producers and fabricators. Control was at first effected through primary fabricators, who were placed on a quota.

On September 24, 1941, the use of copper for wire and rod was restricted to 72 per cent of twice the consumption for the first six months of 1941. Copper manufacture of essential war materials was allowed in excess of this percentage.

On October 8, 1941, M.C. 6 set up a committee on the use of copper and zinc in photo-engraving. Immediately afterwards steps were taken to curtail the use of copper and zinc in that industry.

The use of copper for all construction purposes, except flashing on permanent buildings, was eliminated in October, 1941, although permission was granted to complete unfinished jobs. New orders for copper for these purposes even after acceptance, had to be cancelled unless the material was in the process of manufacture.

On November 1, 1941, the use of copper and copper alloy products was reduced to 60 per cent of the average requirements for 1937, 1938, and 1939. Metal for direct war work was not included.

On November 12, 1941, a representative committee of copper surface-heating manufacturers was set up to report the metal position of the industry.

On November 14, 1941, the cabinet and builders' hardware and lock manufacturers agreed to discontinue the manufacture of an extensive list of wrought and cast brass and bronze items, and to limit the manufacture of additional items.

On November 19, 1941, wire cloth and screen manufacturers agreed to eliminate waste in the manufacture of fourdrinier wire by supplying two and three-seam wire.

On November 25, 1941, the Controller issued instructions for the substitution of lead and black iron for copper and brass in a number of plumbing fixture lines. The manufacture of several items was discontinued.

On November 25, 1941, flatware and hollow-ware manufacturers agreed to substitute Britannia metal (about 92 per cent tin) for copper in silver-plated articles. Since then all use of Britannia metal has been prohibited.

On December 6, 1941, a long list of builders' hardware, memorial plates, and other brass and bronze items was prohibited.

On December 8, 1941, the use of copper and copper alloy water tube and pipe for domestic and commercial use was prohibited, except for industrial use when the eventual consumer certified that no suitable substitute could be obtained.

On January 12, 1942, instructions of December 6, 1941, were extended to prohibit after March 1, 1942, the use of all wrought and cast bronze metal for cabinet, builders', and furniture hardware, except for the interior parts of locks. Only exceptions were requirements for naval and merchant vessels.

On January 19, 1942, instructions were issued prohibiting the sale by manufacturers after June 1, 1942, of the following copper plumbing items:

1. Brass legs and towel bars for lavatories.
2. $\frac{3}{8}$ -inch and $\frac{1}{2}$ -inch brass or copper supply pipes of all kinds. (Galvanized or black iron pipe and fittings were used instead.)
3. Brass bath curtain rods.
4. Brass tubing generally furnished to cover pipe nipples.
5. Copper linings in wooden closet tanks. (Sheet lead to be used as substitute.)
6. $1\frac{1}{2}$ -inch brass traps and confining the use of $1\frac{1}{4}$ -inch traps to residences and hospitals.
7. Copper pipe on all outside water service connections. This was effective after December 31, 1941.
8. All tailpieces for kitchen sinks and laundry trays of copper or brass $1\frac{1}{2}$ -inch by 4 inches. Size $1\frac{1}{2}$ -inch by 3 inches in length is permitted.

On January 23, 1942, instructions were issued consolidating those of December 6, 1941, and January 12, 1942, and applying them to all contracts for Government departments and Government-owned or controlled companies, except contracts for supplying the requirements of naval and merchant ships.

On February 3, 1942, the use of brass or other non-ferrous metal in the manufacture of bicycle licence plates, metal coat and hat checks, dog licence tags, key tags, and metal tokens was prohibited.

On February 27, 1942, all sales of virgin copper were prohibited except under permit.

On March 9, 1942, trading in copper, brass, bronze, and other copper alloy ingots was prohibited, except under permit by the Controller. (The order also applied to zinc).

On March 30, 1942, instructions prohibited the use of copper for flashing on buildings, except by permit.

On April 4, 1942, instructions restricted to four months' normal supply the pulp and paper mills' inventories of fourdrinier wire, cylinder, decker, and thickener facings and backings, and slotted and perforated screens. Under special permit larger inventories could be carried by mills isolated during the winter.

On May 11, 1942, M.C. 13 restricted the production and sale of copper wire. Quotas were established for the three-month period, April 1 to June 30, 1942. Except by permit no person was permitted to:

1. Acquire more copper wire bars for rolling into rods for further fabrication in Canada than 30 per cent of the amount in weight that he received or shipped (whichever weight is greater) in the first six months of 1941.

2. Acquire more copper rods for drawing into wire than 30 per cent of the amount in weight shipped to him in the first six months of 1941.

3. Acquire more drawn copper wire for processing than 30 per cent of the amount in weight shipped to him in the first six months of 1941.

After June 30, 1942, this percentage was reduced to 20 in all instances.

Except under permit by the Controller, no person is permitted to dispose of copper wire acquired under quota except for resale, or for use for one of the following purposes:

1. For the installation, maintenance, or repair of telegraph, telephone, street railway, tram, and other communication and transportation systems and of electric light, hydro, gas, water works, and sewage systems.

2. The manufacture of electrical equipment, but excluding household electrical appliances, portable lamps, and lighting fixtures.

3. Use in primary iron or steel plants.

4. Use in non-ferrous plants and iron mines.

5. Use in chemical and explosive industries.

6. Use in oil refineries.

7. Use in pulp and paper industry.

8. Use in logging industry.

9. Necessary maintenance and repairs to existing installations and equipment subject to certain limitations.

10. Persons to whom a designation number has been allotted by the Wartime Industries Control Board.

11. For new construction (industrial and residential), except for service supply connection.

12. Rewiring existing buildings, limited to the extent of 20 pounds of copper content for each building, with certain exceptions.

13. Wiring required for alterations or extensions to existing industrial establishments when such wiring is required to facilitate the production of war supplies.

Copper wire bars, wire rods and drawn wire could be acquired in addition to the amounts provided under the foregoing quota, if for sale or other disposal to any of the following persons, or for any of the following uses:

1. Department of Munitions and Supply.

2. Department of National Defence.

3. Department of Transport.

4. Royal Air Force (including the Ferry Command).

5. For use in shipbuilding and/or ship repairing.

6. Any person, for use in carrying out a contract with the Department of Munitions and Supply, the Department of National Defence, and the Royal Air Force.

7. For use in aircraft manufacture and repair.
8. For a specified list of Government companies.
9. To a person placing an order bearing an allotment number given by the Metals Controller.

An allotment number could be granted by the Controller to persons not otherwise entitled to acquire copper wire bars, wire rods, or drawn wire. Applicants for allotment numbers were required to state stocks on hand and purpose of use, and certify that if materials were for general stock, the stocks to be ordered, together with stock on hand, would not exceed 30 days' requirements in Eastern Canada, or 45 days' requirements in Western Canada.

On May 22, 1942, effective on June 1, a directive placed wrought copper and copper alloys in the forms of rod, bar, sheet, strip, tube, pipe, and extruded shapes under allocation. Inventories of such wrought copper and copper alloys were restricted to the preceding three months' average consumption, except under permit by the Controller.

Effective in June, 1942, it licensed distributors who wished to carry warehouse stocks for resale. Sales not in excess of 100 pounds per order may be made from these warehouse stocks (and may also be made by unlicensed distributors until their present stocks are liquidated) to a specified list of consumers, and subject to certification of essentiality of the order, without requiring prior approval by the Controller. The persons to whom, and approved purposes for which, such sales of wrought copper and copper alloys (other than pipe and tube) may be made are as follows:

1. Department of Munitions and Supply.
2. Department of National Defence.
3. Department of Transport.
4. Royal Air Force (including the Ferry Command).
5. Any person, for use in carrying out a contract with the Department of Munitions and Supply, the Department of National Defence, the Department of Transport, and the Royal Air Force, including the Ferry Command.
6. For use in shipbuilding and ship repairs.
7. For use in the manufacture of aircraft or repairing aircraft.
8. For a specified list of Government companies.
9. For the installation, maintenance or repair of telegraph, telephone, street railway, tram, and other communication and transportation systems, and of electric light, hydro, gas, water works, and sewage systems.
10. The manufacture of electrical equipment, but excluding household electrical appliances.
11. Use in iron or steel plants.
12. Use in non-ferrous plants and mines.
13. Use in chemical and explosive industries.
14. Use in oil refineries.
15. Use in pulp and paper industries.
16. Use in logging industry.
17. Necessary maintenance and repairs to existing installations and equipment.

Pipe and tube could be sold from warehouse stocks only for the following purposes, and in amounts not in excess of 300 pounds per order, except under permit:

1. Ship construction or repair.
2. Manufacture and repair of ordnance equipment.
3. Manufacture and repair of aircraft.

4. Necessary maintenance and repair of motor vehicles when no suitable substitute can be used.

Purchasers were required to certify:

1. Purpose of use.
2. That material is required for an essential purpose, and that no substitute is available.
3. That the order has not been placed elsewhere.
4. That the quantity ordered taken together with stocks on hand, does not exceed preceding three months' consumption.

The following sales could be made only after the customer's order had been approved by the Controller:

1. Sales from warehouse stocks in excess of 300 pounds.
2. All sales from warehouse stocks other than those permitted by the provisions of the foregoing lists.
3. Sales by the primary producer.

Customers were required to send orders direct to the Controller, and such orders, if approved, would then be forwarded by the Controller to the supplier indicated.

On June 17, 1942, M.C. 17 restricted photo-engravers, rotogravure engravers, and electrotypers to 100 per cent of the copper they used on an annual average between 1937 and 1940, inclusive; and limited the stocks they could keep on hand. (See also zinc.)

On September 1, 1942, M.C. 13A, replacing M.C. 13, provided that during the quarter ended September 30, 1942, or in any quarter thereafter, except by permit no person shall purchase or acquire:

- (a) More copper wire bars for rolling into copper wire for further fabrication in Canada,
- (b) More copper wire rods, for drawing into wire,
- (c) More copper wire for processing than, in each instance, a quota of 20 per cent of the amount in weight acquired for such purpose (in the instance of copper wire bars, acquired or shipped, whichever weight is greater) during the first six months of 1941, unless such purchase or acquisition is to fill orders for the following which are considered "ex-quota":

1. Department of Munitions and Supply.
2. Department of National Defence.
3. National Research Council.
4. Department of Transport.
5. Royal Air Force (including Ferry Command).
6. Any person, for use in carrying out a contract with the foregoing agencies.
7. Shipbuilding and/or ship repairing.
8. The manufacture of aircraft and/or repairing aircraft.
9. Companies owned or controlled by His Majesty in right of Canada in respect to work done on contracts directly related to war work.
10. Export, when approval for such export has been given by the Metals Controller and export permit obtained.
11. To replace stock sold to persons selling ex-quota.
12. Any special purposes subsequently authorized by the Controller as ex-quota.

Except in the instance of acquisitions for ex-quota purposes, as defined in the foregoing, no person shall, without a permit, sell, purchase, or put into use any copper wire other than for the following purposes and/or to the following persons:

1. For the installation, maintenance, or repair of telegraph, telephone, street railway, tramway, and other communication and transportation systems, and of electric power, gas, water, and sewage works and systems.

2. The manufacture of electrical equipment, but excluding household electrical appliances, portable lamps, and lighting fixtures.

3. Use in primary iron and steel plants and iron mines.

4. Use in primary non-ferrous plants and mines.

5. Use in chemical and explosive industries.

6. Use in oil refineries.

7. Use in the pulp and paper industry.

8. Use in the logging industry.

9. Necessary maintenance and repairs to existing installations and equipment subject to the limitations in Section 12.

10. For new building construction, excluding service connection, and only after assurance has been obtained from the supply utility that power and non-ferrous conductors can be made available to provide service.

11. For use by a person holding a Wartime Industries Control Board designation number for the purpose specified therein.

12. Re-wiring existing buildings, limited to the extent of 20 pounds copper content for each building, except for purposes included in Section 13. This also includes the wiring of existing buildings.

13. Wiring required for alterations or extensions to existing industrial establishments when such wiring is required to facilitate the production of war supplies.

14. A consumer, when the copper content of the wire does not exceed one pound in weight. (No consumer's certificate is required for such a purchase.)

15. To a person for re-sale, on certification as to the end use.

16. To persons holding an allotment number from the Metals Controller.

An allotment number may be granted to persons not otherwise entitled to acquire copper wire under either the quota or ex-quota lists shown in the foregoing. Applicants for allotment numbers must state stocks on hand and purpose of use, and certify that, if materials are for general stock, the stocks to be ordered, together with stocks on hand, will not exceed 30 days' requirements in Eastern Canada, 45 days' requirements in Western Canada.

All deliveries of copper wire require a certificate of ultimate purpose of use to be filed with the supplier by the purchaser, except in the instance of deliveries to the following:

1. A holder of an allotment number.

2. Purchases not in excess of one pound.

3. Department of Munitions and Supply.

4. Department of National Defence.

5. National Research Council.

6. Department of Transport.

7. Royal Air Force (including the Ferry Command).

On September 1, 1942, M.C. 23 regulated the use of copper or other non-ferrous metals for the extension of public utility services. In general, the order

provided that no public utility, furnishing electrical, telephone, telegraph, electric railway, street car, water, sewage, gas, or steam service, shall put into use any non-ferrous metal without a permit. Specifically, it exempted the use of such metals for necessary maintenance and repair, for emergency requirements of the Armed Forces, and for certain essential military and civilian direct connections from lines, leads, and mains, the installation of which costs no more than \$500 and involves no more than 250 feet of cable, pipe, or line, or alternatively not more than 20 pounds of non-ferrous metals.

The order also stated that no construction involving the use of non-ferrous metal, whether with or without a permit, may be undertaken by any utility or company unless the minimum use is made of such metals, unless unnecessary construction is avoided, and unless existing fabricated or less critical materials are used whenever possible in preference to scarce materials.

On October 2, 1942, M.C. 26 prohibited the production of any steel plate or sheet containing copper, except by permit.

On October 2, 1942, a directive reduced the quotas for the fourth quarter under M.C. 13A from 20 per cent to 12½ per cent.

On December 17, 1942, M.C. 38 superseded a directive given by the Metals Controller on May 22, 1942, to consumers and distributors of wrought copper and copper alloys. The order placed wrought copper and copper alloys in the form of rod, bar, sheet, strip, rolls, tube, pipe, extruded shapes, welding rod, and copper base alloy redrawing rod and wire, under allocation.

The following sales might only be made after the customer's order has been approved by the Controller:

1. Sales from warehouse stocks in excess of 300 pounds
2. All sales from warehouse stocks other than those permitted by the specific provisions of this Order.
3. Sales by the fabricator.

It licensed distributors who wish to carry warehouse stocks for resale. Sales not in excess of 300 pounds per order may be made from these warehouse stocks without permit from the Controller, but only to a specified list of customers, and subject to certification of essentiality of the order. The persons to whom, and approved purposes for which, such sales of wrought copper and copper alloys (other than tube, or strip or sheet for incorporation into any building) might be made are as follows:

- (a) Department of Munitions and Supply.
- (b) Department of National Defence.
- (c) National Research Council.
- (d) Department of Transport.
- (e) National Harbours Board.
- (f) Royal Air Force (including the Ferry Command).
- (g) Any person for use in carrying out a contract with the organizations named in sections (a) to (f).
- (h) For use in shipbuilding and ship repairing, including commercial fishing boats and equipment but not including pleasure craft.
- (i) For use in the manufacture of aircraft and/or repairing aircraft.
- (j) Companies owned or controlled by His Majesty in right of Canada in respect of work to be done on contracts directly related to war work.
- (k) For the installation, maintenance or repair of telegraph, telephone, street railway, tram and other communication and transportation systems, and of electric power, gas, water works and sewage systems.
- (l) The manufacture of electrical equipment, but excluding household electrical appliances, portable lamps and lighting fixtures.
- (m) The manufacture of farm machinery and equipment.
- (n) Use in primary iron and steel plants and iron mines.

- (o) Use in primary non-ferrous plants and mines.
- (p) Use in chemical and explosive industries.
- (q) Use in oil refineries.
- (r) Use in the pulp and paper industry.
- (s) Use in the logging industry.
- (t) Necessary maintenance and repairs to installations or equipment, including motor vehicles, but not including installations or equipment used only for recreation or amusement.
- (u) Use in essential refrigerating and air-conditioning and other equipment for which a permit has been granted by the Controller of Supplies.

Without permit from the Controller, copper tubing might be sold from warehouse stocks only for the following purposes, and then only in amounts not in excess of 300 pounds per order:

- (a) For use in shipbuilding and ship repairing, including commercial boats and equipment, but not including pleasure craft.
- (b) Manufacture and repair of ordnance equipment.
- (c) Manufacture and repair of aircraft.
- (d) Necessary maintenance and repairs of machinery or equipment, including motor vehicles, when no suitable substitute for such tubing can be used. (This does not include machinery or equipment used only for recreation or amusement.)
- (e) Refrigerating and air-conditioning installations for which a permit has been granted, and necessary repairs to existing refrigerating and air-conditioning installations.
- (f) Purchase by a sub-distributor from a licensed distributor, of automobile and/or refrigerating and air-conditioning tubing for resale in the same form as purchased.

Sub-distributors of copper tubing may purchase such tubing from licensed distributors without permit from the Controller, but must certify to the distributor:

- (1) That he will not sell or dispose of the tubing delivered to him for other than the uses specified above.
- (2) That the stock carried by him of automobile and/or refrigerating and air-conditioning tubing does not exceed 30 days' normal requirements (or 45 days' normal requirements if located at or west of Port Arthur and Fort William).

A sub-distributor may purchase copper or copper alloy welding rods from a licensed distributor by declaring to him in writing:

- (a) That he will only re-sell in accordance with the regulations governing sales by licensed distributors.
- (b) That his stock is not in excess of 30 days' normal requirements (or 45 days if he is located at or west of Fort William or Port Arthur).

No person should acquire, dispose of or put into use any copper sheet or copper strip for incorporation into any building except copper fabricated in the form of weatherstripping.

NOTE: Application Form MCC5 required for all purchases of wrought copper and copper alloys (except copper wire products) in amounts in excess of 300 pounds and for purchases of less than 300 pounds by other than approved users, requires the following information:

- 1. End use of material desired.

2. If the order is for an alloy containing tin or nickel, has a substitute been sought?
3. Duplicate material has not been ordered elsewhere.
4. Material ordered will not increase stocks beyond three months' normal requirements.

Corundum

Corundum is an abrasive. Before the initial victories in North Africa made it appear late in 1942 that the North American shortage may be alleviated by imports from that continent, known deposits in Ontario were being investigated by the Metals Controller and the results had been encouraging. Canadian requirements of this mineral are virtually nil, since almost all abrasive needs here are met by artificial abrasives.

Diamonds

Industrial diamonds come from Brazil and South Africa. There is no immediate shortage.

Fluorspar

Canada is short of fluorspar of all kinds, and is particularly short of the metallurgical grade. At the end of December, 1942, the domestic requirements for the making of aluminum were being imported from the United States, and most of the requirements for the steel industry also were being imported. Two old properties at Madoc, Ontario, were producing small quantities for the Ontario steel mills. Other properties are being examined by the Department of Mines and Resources in collaboration with the Metals Controller. One of these is in British Columbia.

Graphite

The occupation of Madagascar has eased somewhat the serious Allied shortage of graphite, as supplies are now being shipped from that island. Graphite is used for crucibles in which steel and other metals are melted. Up to the present, graphite crucibles have not been manufactured in Canada and this country has been dependent on the specialized plants in England and the United States for its relatively small needs.

Canadian graphite deposits have been worked at intermittent periods in the past, but when this country entered the war it had no production of crucible grade, although

it had a supply of graphite suitable for other purposes such as foundry facings, lubricants, and sundries.

Iron Pyrites

Iron pyrites are very common. The form used commercially in Canada is a by-product of the smelting of copper at Aldermac and Noranda mines. Part of the output is exported, the remainder being used in the manufacture of sulphuric acid.

Lead

Lead supplies and production were sufficient at the end of 1942 for current requirements, but because of increasing war demands and the increasing use of lead as a substitute for copper and brass, it has been placed under direct allocation control. The consumption in December, 1942, was nearly three times that of the same month in 1939.

Canada and Mexico are big lead producers. Most of Canada's output beyond domestic requirements goes to the United Kingdom. Most of Mexico's surplus goes to the United States, which is itself a producer. Further production in Canada is looked for in 1943.

On November 25, 1941, the Controller ordered the substitution of lead and black iron for copper and brass in a number of plumbing fixtures. Since then informal instructions have been given for the use of lead as a substitute in a great variety of products previously made from scarcer metals.

On May 2, 1942, M.C. 11 prohibited the acquisition of virgin lead from any person who owns or operates a primary smelter, except by permit.

On June 20, 1942, M.C. 11A rescinded M.C. 11. The new order placed virgin and secondary lead and lead base alloys (except type-metal, babbitt, and solder, which are covered by the restrictive order on tin) in pig or ingot form from a smelter or ingot-maker, on direct allocation.

Magnesium

Canada is now self-sufficient in its supply of magnesium, and is able to export some tonnage to other Allied nations, but until the \$3 million project of the Government-owned Dominion Magnesium Limited at Haley, Ontario, turned out its first crown in the summer of 1942, millions of tons were locked in brucitic limestone and dolomite ores, but not one pound of commercial magnesium was available that had not been imported.

To extract magnesium oxide from those plentiful ores would have been easy enough, but the problem that faced

the metallurgist was how to remove the oxygen from the oxide quickly and cheaply, without causing an explosion. Thanks to the foresight of Lieutenant-General A. G. L. McNaughton, Canadian Army commander, then president of the National Research Council, a young McGill graduate, Dr. Lloyd M. Pidgeon, a native of Markham, Ontario, was assigned to tackle the problem in the council's laboratories in 1937. By November, 1940, he had found a laboratory answer and within another year had proved the process commercially. Still secret as to detail, this process like many another discovery, proved to be comparatively simple. Others had tried an electric furnace, and had used a vacuum. To these, Dr. Pidgeon added two vital developments that were startlingly novel, and the process worked.

Only a few miles from the Ottawa River and not far from Renfrew, the site of the Dominion Magnesium plant is a wilderness of sand and rock, pine trees, and second-growth birch. Chosen not because it was the only source of dolomite, but because the outcropping was close to available power, the site had the advantage of being conveniently near transcontinental railway lines and not too far from other war industries.

On a sunshiny, sub-zero day in the first week of February, 1942, workmen with pneumatic drills broke through twelve inches of frozen topsoil to turn the first sod. Fifteen days later the first concrete was poured, and within a little more than six months enough of the plant was constructed to begin operations with brucitic limestone brought in from the Aluminum Company of Canada. With no ceremony, no headlines, the first crown of magnesium left the reduction furnace on August 15. Less than three months later, on November 9, the crushing and calcining plants were nearing completion, and the company swung over to the use of dolomite ore from its own backyard. By December 15, 1942, construction work was completed and the daily output was approaching its peak.

In the production of magnesium, ferro-silicon is used as a reducing agent. It is estimated that from one ton

of ferro-silicon and 14 tons of dolomite, one ton of magnesium ingots can be produced.

Magnesium is a metal so weak in its pure state that a small boy could bend a half-inch bar, yet so tough as an alloy that it will stand the shock of landing a 30-ton warplane. It is so effective as an incendiary ingredient that it will burn up many a German city, yet so inert as a solid that a 3,500-degree blow torch could be applied to it and it would not burn.

To the chemist it is a metallic element which, in its natural state as an oxide associated with other elements, is almost as common as iron, and in its artificially pure state is just about as rare as silver. As far as North America is concerned, Canada has pioneered in its production. First commercial output on this continent was from United States raw materials processed by Shawinigan Electro Metals Company from 1915 to 1919 in Shawinigan Falls, Quebec. First production from Canadian materials, and first use of the new, more rapid and safer Pidgeon process, was at the Dominion Magnesium plant. Already the United States Government is applying the same process in plants which will cost about \$40,000,000.

When war broke out the production of magnesium on this continent was insignificant. By the end of 1943, the United States and Canadian production total will exceed that of the Axis and should be sufficient to meet all war requirements.

Until the output from Haley began to flow, the North American supply was coming from the treatment of sea water or subterranean brine in the United States. Now that more or less ample supplies are assured, war uses of the metal are almost certain to multiply. Meanwhile, its chief use is in aircraft alloys, metals tough enough to stand terrific flying strains and stresses, yet light enough to add hundreds of miles to the effective range of a bomber or fighter. Every bit as important to the airman, is the use of magnesium as an ingredient of parachute flares so brilliant that they will light up a large target area thousands of feet below the aircraft.

In addition, magnesium is used in night bombs¹, in certain shells, and in other pyrotechnics.

Dominion Magnesium Limited is a private concern, operating without profit or fee, financed by the Federal Government, and under the supervision of Wartime Metals Corporation, a Crown company. (See Wartime Metals Corporation).

Each order for magnesium must have prior approval of the Metals Controller before it is filled. Imports and exports are by licence approved by the Controller.

Manganese

All manganese metal in Canada is under strict allocation by the Metals Controller. In the past the chief sources for Canadian requirements have been Takoradi on the Gold Coast of Africa, Brazil, Cuba, the U.S.S.R., Baluchistan, and the east coast of India. At the end of 1942 the chief sources were New Caledonia and the Gold Coast.

Canada's known deposits are limited in size and unless new discoveries are made, this country must continue to depend on outside sources.

Manganese is necessary in the production of the steel used in ships, guns, tanks, and hundreds of other tools of war.

Mercury

Since the war began Canada has developed enough mercury to satisfy all Canadian war requirements, and to provide exports to the United States and to the United Kingdom.

Mica

In peacetime, most of the mica requirements of the North American continent were supplied by Madagascar, Ceylon, India, and South America. Deposits of muscovite mica have been operated for many years in the United States. In Canada, the commercial deposits were of the phlogopite or amber variety.

During 1942 important discoveries of the muscovite or clear mica were made in Ontario and Quebec. Production from the Ontario deposit, which compares in

quality with that of any in the world, was begun in the summer of 1942 and is being made available to the United Nations. Development of the Quebec deposit was begun in the fall of 1942.

The British occupation of Madagascar, the world's greatest producer of the phlogopite grade, eased somewhat the Allied shortage of that grade.

Mica is important for electrical insulation and for numerous other war purposes.

Molybdenum

Molybdenum is an alloying metal important in the manufacture of tough, durable steels for armour plate, shells, and high-speed tools.

Most of the Canadian requirements have been imported from the United States, which produces approximately 90 per cent of the world's supply. Since the war began exploration has revealed substantial deposits in three Canadian provinces. Two mines in Quebec were producing small quantities at the end of 1942, and by the summer of 1943 a larger producer in the same province will come into operation. The Metals Controller has negotiated contracts with two prospective producers—one in Ontario, the other in British Columbia. It is expected that when these latter properties begin shipping ore a substantial proportion of the Canadian needs will be met from Canadian output.

Nickel

Nickel production during 1942 was many times that of 1914. Canada is providing 95 per cent of the nickel available to the Allies, and the remaining output is coming from New Caledonia.

International Nickel Company of Canada and Falconbridge Nickel Company are the sole producers of primary nickel in Canada. At both mines expansion work took place in 1942 and by the end of that year peak production had been reached.

After the outbreak of war, and prior to any official action, International Nickel Company, in co-operation

with the Metals Controller, took steps to exercise a measure of control over domestic consumption.

The Controller later instructed the companies to restrict the use of nickel as far as possible to war industries. Arrangements were made to record and control the priority allocation of nickel and nickel-bearing alloys. Nickel for electroplating purposes was reduced to 50 per cent of the 1940 and 1941 consumption.

Consumption of nickel for war and essential civilian purposes has left only a small amount for other uses. In 1940 the war and essential use was 60 per cent, in 1941 it was 85 per cent, and in 1942 it was at least 95 per cent. The silverware manufacturers, as an example, agreed to reduce the nickel content of nickel-silvers from 18-21 per cent to 12 per cent on September 1, 1941, and by the spring of 1942, they were getting no nickel at all. The greatest civilian saving, however, was effected by the stoppage of passenger car and civilian truck manufacture. Next in importance was the saving made possible by revisions in nickel alloy specifications.

On November 18, 1941, the use of nickel-silver for slide fasteners was prohibited, except for essential use in certain war orders.

On May 4, 1942, effective May 5, the use of nickel in the production of nickel-silver was prohibited, except by permit.

On May 12, 1942, M.C. 14, effective June 1, prohibited the acquisition of primary nickel, except by permit, and thus eliminated the remaining small civilian consumption.

On November 16, 1942, M.C. 34 provided that on and after November 16, 1942, except by permit, no person was permitted to purchase or acquire for use or consumption, or put into use or consume, any nickel mill products. Nickel mill products, for the purpose of the order, mean all mill products of pure nickel or any alloy of nickel, containing 50 per cent or more by weight of nickel or nickel plus chromium, produced by any hot or cold working process.

On December 9, 1942, M.C. 36 prohibited, except by permit, the use of nickel for any type of plating, except for surgical instruments, hospital supplies, dairy equipment, and scientific and electrical control instruments for the Armed Forces.

Platinum

Canada uses only a very small percentage of the platinum produced from its mines. As a by-product of nickel smelting, it is shipped to the United States for refining, and brought back as the finished product. The re-importation figures have risen rapidly since the war began.

In small quantities, platinum is used for a wide variety of war purposes, including scientific precision equipment, fine electrical apparatus, thermal instruments and acid-resistant crucibles. It is also used as a chemical catalyst and by the dental profession.

To assure a sufficient war supply its use in general was restricted by a Controller's order. Earlier an order of the Administrator of Jewellery, Wartime Prices and Trade Board, issued on November 17, 1942, had eliminated the use of platinum in various jewellery items.

On December 9, 1942, M.C. 37, effective January 15, 1942, restricted the use of platinum and the platinum group metals, and licensed certain dealers to handle such metals. The object of the order was to conserve supplies, and to prevent any possibility that the metals might leave the country and get into enemy hands.

Radium

Before the war, a Belgian refinery turned out most of the world's radium supply, the ore having originated in Africa, but Canada was fortunate enough to have a radium plant in operation treating high-grade domestic pitch-blende. Now that the Belgian refinery is in the hands of the Nazis, the Canadian refinery is the most important in supplying war requirements.

Under bombing attacks, the large X-ray tubes in hospitals are easily damaged and for this reason, the hospitals have been returning to the use of radium.

[Silica

Silica is the mineralogist's name for sand, but the type of sand used industrially must meet certain specifications. The silica used in the making of ferro-silicon is in plentiful supply. Silica is also used as a fluxing agent.

Much of Canada's supply is imported from the United States.

Silver

Traditionally regarded as a precious metal and as a medium of exchange, silver is now taking its place as a war metal. Eminently satisfactory as a substitute for tin in solders and brazing alloys, its use has been increasing month by month. As one of the largest silver producing

countries in the world, Canada is in a good position to make full use of the metal.

On September 29, 1942, M.C. 25 provided that after September 30, 1942, no person shall acquire, purchase, sell, or supply more than 500 troy ounces of fine silver or more than 500 troy ounces of silver contained in an alloy of silver. The order permitted the use of silver for making brazing alloys or solder containing not more than 50 per cent silver.

Tin

In peacetime, three-quarters of the world's supply of tin came from Malaya and the Netherlands East Indies. Bolivia was next in importance, and some also came from the Belgian Congo and Nigeria.

When Japan over-ran the South Seas that source of supply was cut off, and the United Nations were deprived of 75 per cent of their tin imports. Shipments from the other sources run the risk of enemy action at sea.

Canada produces no tin ores, although she now has a small production of refined tin as a by-product from certain lead-zinc ores.

Under these circumstances, the Controller has assumed that the only tin Canada will have for the duration of the war is the stockpile now on hand. Accordingly, he has taken steps, not only to eliminate non-essential civilian uses, but also to reduce the tin content wherever possible in the specifications for guns, tanks, warplanes, and other war supplies.

On April 3, 1941, under M.C. 1, a tin committee was formed.

On July 30, 1941, M.C. 3 added a member to the tin committee.

In the summer of 1941, a reduction of 10 per cent in the coating of tin plate for most purposes was effected in conformity with steps taken in the United States.

Meetings were first held with the tin plate manufacturers, and representatives of the canning industry, at which meetings the Food and Drug Laboratory, Department of Pensions and National Health, was represented. An order-in-council, P.C. 6554, dated August 26, 1941, covering the canning of food products, was issued by the latter Department, under the War Measures Act, in connection with this reduction of tin coating.

On September 11, 1941, M.C. 4 determined that terne plate or enamelled black plate must be substituted for tin plate wherever possible.

On November 25, 1941, flatware and hollow-ware manufacturers agreed to substitute Britannia metal (about 92 per cent tin) for copper in silver-plated articles. Since then, however, all use of Britannia metal has been prohibited.

On November 27, 1941, P.C. 9250 amended P.C. 7495 of December 18, 1940, by authorizing an increase in the Government stockpile of tin.

Following the outbreak of war in the Pacific, all stocks of tin were frozen.

On December 17, 1941, the Controller prohibited, as of December 8, the sale of pig tin other than to war and essential industries, except by permit. He issued an essentiality list applying to the use of tin and tin alloys, and ordered that purchasers must state the purpose for which they intend using the metal or tin alloys and certify that their total of stocks on hand would at no time exceed 30 days' supply. He restricted the use of tin as follows:

Bearing metal or babbitt—Maximum tin content 15 per cent except for ship maintenance, repair, or construction or by special permit of the Controller.

Body solder—Use of virgin tin prohibited. Maximum secondary tin content 25 per cent. Purchasers limited to 50 per cent of average monthly purchases in the first six months of 1941.

Other solders—Except under permit, maximum tin content 38 per cent. Except for direct war and essential industries, purchasers limited to 75 per cent of average monthly purchases in the first six months of 1941.

Block tin pipe—Manufacture prohibited.

Copper-tin alloys—Use of virgin tin prohibited except for ship, airplane, and ordnance maintenance, repair or construction, or on special certification that no satisfactory substitute is obtainable.

Britannia metal—Manufacture prohibited.

Type metal—Use of virgin tin prohibited.

On January 16, 1942, the tin content of tubes containing tooth paste, shaving cream, and a wide variety of medical preparations was reduced to 12 per cent.

On February 5, 1942, the use of tin for the production of tinplate to be used for packaging a wide list of food and industrial products was prohibited.

On February 6, 1942, instructions were issued prohibiting the use of virgin tin after February 28 and scrap tin after March 31 in the manufacture of composition tinfoil for cigarette packaging, Christmas tree decorations, or electrical condensers.

On February 11, 1942, the following new restrictions, revising instructions issued on December 17, 1941, were imposed on the use of tin and tin alloys:

Virgin tin—Sale or use prohibited except under permit.

Babbitt—Manufacture, sale or use of babbitt containing over 15 per cent tin prohibited except under permit. Purchases of babbitt, together with stocks on hand, limited to 30 days' supply.

Body solder—Manufacture prohibited. A body filler produced from scrap and containing not over three per cent tin may be made, but purchases together with stocks on hand limited to 30 days' supply.

Other solder—Manufacture or sale of solder containing over 38 per cent tin prohibited except under permit. Purchase of solder containing 38 per cent tin or less limited to 75 per cent of average monthly purchases during the first six months of 1941; where this quota will not meet war or essential requirements, a special written release may be obtained.

Copper alloys containing tin—Use of virgin tin prohibited except under permit.

Block tin pipe—Manufacture prohibited.

Britannia metal—Manufacture prohibited.

Type metal—Use of virgin tin prohibited.

On February 13, 1942, manufacturers of crown caps for beverage bottles were prohibited from using any metal containing tin. (See April 1, 1941.)

On February 26, 1942, the use of tin for the production of tinplate to be used in a wide variety of household articles was prohibited, except by permit. The articles affected were:

All household articles whether plain or decorated, acoustic tile plates, baking pans, bath tubs, bread and cake boxes, bread and cake pans, coal oil cans, cookie and biscuit cutters, cookie tins, cookie sheets, corn cake pans, muffin pans, turk's head pans, collanders, cups, mugs, curtain rods, dish pans, salt and pepper boxes, feeding troughs, flour and tomato sieves, flour cans, funnels (except $\frac{1}{4}$ pints, pints, and quarts), grocery sets marked "Flour," "Coffee," etc.; guardian fire screens, head cheese bowls, heating and air conditioning pipes, ducts and appliances; jar fountains, jelly cake plates, shielded wall lamps, lunch boxes, measures other than those for Government test measuring, milk pans, sewing machine oil cans, pie plates, potato ricers, pot covers, pudding pans, sap buckets, shanty dishes, soap flake dispensers, steamers, stove pipes, wall and floor thimbles for fitting stove pipes, tea kettles, trimmings for fruit boxes and baskets, vacuum cleaner parts, wash boilers and covers, wash bowls, and water dippers.

On March 6, 1942, the use of tin in the manufacture of tinplate carrying in excess of 1.25 pounds of tin per base box was prohibited unless for the preserving of an approved list of foods for which tinplate carrying not in excess of 1.5 pounds of tin per base box was permitted.

On March 7, 1942, the use of more than 10 per cent tin in the coatings of conductors on electric wires and cables manufactured under specifications of the Canadian Electrical Code was prohibited as of March 30.

On March 14, 1942, instructions prohibited, except by permit, the use of tin for tinplate containers used in packaging clam chowder, clam bouillon, scallops, salmon in less than 8-ounce units, lobster in less than 6-ounce units, and haddies in less than 14-ounce units.

On April 1, 1942, the previous instruction prohibiting use of tinplate for crown caps was deferred from March 31 to April 15.

On April 3, 1942, effective April 10, the use of tin for tinplate in packaging shoe polish or lighter fluids was prohibited, except by permit.

On June 30, 1942, M.C. 18 consolidated all previous orders and banned the use of tin except for such purposes as had been approved by the Administrator of non-ferrous metals, together with dairy equipment, babbitt on a restricted basis, and solder on a rationed basis. It reduced tin content in collapsible tubes to $1\frac{1}{2}$ per cent.

As Metals Administrator of the Wartime Prices and Trade Board, the Controller issued a series of orders restricting the use of tin in articles reaching the housewife and other ultimate consumers.

On September 22, 1942, a directive ordered all holders of virgin tin to sell it to the Metals Controller for a Government stockpile. The owners were indemnified on a basis of cost plus handling, weighing and carrying charges.

On October 23, 1942, M.C. 18A rescinded M.C. 18. Effective October 23, 1942, without a permit from the Controller no person might acquire or use any tin, and no manufacturer might use any tin, tin alloys or tin products (in primary form) except to the extent or on the conditions hereinafter set out:

Component Material	Permitted Product
Tin and Tin Alloys.	Tin Plate and Terne Plate. Manufacture or repair of dairy equipment or products therefor.
Tin Products (Primary Form).	Manufacture and repair of dairy equipment.
Tin Plate and Terne Plate.	Containers, dairy equipment or products therefor.

NOTE: In the instance of dairy equipment and products therefor, the amount of tin in the above forms is restricted to a minimum required to prevent corrosion from milk products. All purchasers of tin, tin alloys, or tin products, for the manufacture or repair of dairy equipment shall (prior to purchase or acquisition) file with the seller a certificate stating the quantity, nature, and purpose of use of the materials required.

In the instance of containers made from tinplate and terneplate, acquisition for use must be only for a purpose authorized by the Administrator of Metal Containers as set forth by him in Administrator's Order A-425, October 23, 1942.

Babbitt might only be manufactured by ingot makers licensed under M.C. 10, and without special permit no babbitt might be manufactured with a tin content of over 73 per cent.

Allowable Percentage	Permitted Purpose of Use
Over 73 per cent.	Under Permit only.
Up to and including 73 per cent.	Electric railway armature bearings and naval bearings as specified by the R.C.N. or B.A.T.M.
Up to and including 66 per cent.	Bearings for ocean-going merchant ships: Main engine crankpin mains, Main engine crankshaft mains, Main engine crosshead slippers, Michell thrust collars, stern tubes, "A" frames, and crankheads (big end) bearings on force lubricated steam engines.
Up to and including 15 per cent.	All other bearings.

NOTE: All purchasers of babbitt for electric railway armatures and marine bearings shall (prior to purchase or acquisition) file with the seller a certificate stating the analysis, quantity, and specific purpose of use of the babbitt required, and that the purpose is not in contravention of the terms of this order.

Solder might only be manufactured by ingot makers licensed under M.C. 10, provided that solder for use in automotive body work (called body filler) is not manufactured from any tin alloy.

Allowable Percentage of Tin	Permitted Purpose of Use
Up to and including 60 per cent.	Armature leads to commutators.
Up to and including 38 per cent.	Ends or side seams on tin plate or terne plate container. NOTE: After December 31, 1942, no solder containing tin may be used for container side seams.
Up to and including 30 per cent.	General soldering, excluding wiping, lugs on electric cables and automotive radiator dipping.
Up to and including 20 per cent.	Wiping, excluding wiping on automotive body work or new plumbing installations.
Up to and including 15 per cent.	Automotive radiator dipping.

Solder containing between 30 per cent and 38 per cent tin, in possession of consumers as of October 23, 1942, may be used for any soldering except wiping and automotive radiator dipping. Any person may purchase and use body filler or body solder (containing not more than 3 per cent tin) already manufactured at the date of this order.

If consumer's purchases of solder in 1941 averaged over 38 per cent tin, purchases of solder in 1942 are restricted to a total tin content not greater than 20 per cent of total solder purchased in 1941.

If consumer's purchases of solder in 1941 averaged less than 38 per cent tin, purchases of solder in 1942 are restricted to a tin content not greater than 50 per cent of the tin content of the solder purchased in 1941.

(Purchasers who acquired less than 50 lbs. of solder in 1941 are allowed to purchase up to 50 lbs. in 1942 and each subsequent year. Body solder and body filler are excluded from the foregoing quota calculations.)

Subject to any restrictions imposed in other orders of the Controller, copper wire processors might use tin alloys for coating copper wire if the alloy used does not contain over 10 per cent tin.

Collapsible tubes were restricted to a tin content of $1\frac{1}{2}$ per cent of total metallic weight. The manufacture of collapsible tubes for tooth paste less than $\frac{3}{4}$ in. by $4\frac{3}{8}$ in. in size, and collapsible tubes for shaving cream less than $\frac{7}{8}$ in. by $4\frac{3}{4}$ in. in size was prohibited.

Ingot makers licensed under M.C. 10 may use scrap containing up to and including 95 per cent tin for manufacturing, refining or toning type metals. Type metals may be acquired or used for printing purposes only.

All persons purchasing or acquiring tin, tin alloys or tin products containing more than two per cent tin, must file with the vendor a certificate stating that his stocks on hand do not exceed 30 days' supply. A certificate is not required from small purchasers whose 30 days' supply is less than 50 pounds.

On November 12, 1942, M.C. 31 established a Babbitt Advisory Committee.

On November 12, 1942, M.C. 32 established a Solder Advisory Committee.

Tungsten

Tungsten is used primarily in the production of high-speed steels, and is thus employed in almost every phase of war manufacture. It is also used for hardening shell tips and for the filaments of electric lamps. In powder form it goes into the manufacture of cemented tungsten carbides.

Some tungsten comes from South America, some is produced in the United States, and a small amount is mined in Canada. Some also has come from Australia, New Zealand, and Malaya, but the principal source of the world's supply has been China, the outlet being the Burma road. When the Japanese severed that road and made shipping in the Pacific hazardous, this continent had to fall back on its own production, plus the stockpiles accumulated in the event of such an emergency.

Canadian production has been stimulated by the war. The gold mines have found quantities of scheelite, the tungsten ore, in their gold ores, and production is being secured from properties in British Columbia, Ontario, Quebec and Nova Scotia. The most important discovery yet made on this continent is in British Columbia, and this find is being developed by the Wartime Metals Corporation for the Metals Controller. It is expected that this new mine will be in substantial production by the summer of 1943.

Canadian scheelite ore in the form of concentrates rating 60 per cent WO_3 or better is shipped direct to a

steel plant in Ontario. Concentrates of a lower grade are shipped to the United States for recovery.

Soon after taking office the Controller under P.C. 7010 of November 29, 1940, set up a Government stockpile of ferro-tungsten.

The Controller has arranged that small operators of tungsten properties may ship ores for treatment at the Ore Dressing Laboratories, Department of Mines and Resources, Ottawa. These operators are required to send a representative sample of the material for analysis prior to shipment in quantity. This makes possible a determination of the grade so that the operator may avoid financial loss which would be incurred by shipping inferior grade material. Operators in Quebec may follow the same procedure in shipping ores for treatment at the Provincial Mines School, Val d'Or, Quebec.

New methods have been developed for economy in the use of tungsten. For example, molybdenum has been substituted wherever possible in the making of machine tools.

On November 27, 1941, P.C. 9271 amended P.C. 7010 of November 29, 1940, and P.C. 2509 of April 10, 1941, by authorizing an increase in the Government stockpile of tungsten.

On July 15, 1942, M.C. 21 established at \$24 the maximum price per 20-pound unit at which any person may sell for civilian use tungsten scheelite ore containing not less than 65 per cent tungsten trioxide, f.o.b. Welland, Ontario.

On October 1, 1942, M.C. 21A raised this price to \$26.50 per unit for a grade of not less than 60 per cent tungsten trioxide.

Vanadium

The supply of vanadium is critical.

In peacetime, Peru and Northern Rhodesia provided most of the world's supply, and these are still the most important sources.

Experiments are being conducted by the Wartime Metals Corporation, in behalf of the Metals Control, in the collection of vanadium-containing ash residues from oil burning ships on both Canadian coasts. These residues are being treated in the United States. The National Research Council, in collaboration with the Metals Control, has determined that Newfoundland iron ore slag is a source of vanadium, and it is expected that a commercial

extraction process will be developed. Several Ontario deposits of magnetite ore, which contains some vanadium, are being tested by the Department of Mines and Resources in the hope that some means for extracting the vanadium may be developed.

Vanadium is used as an alloy in certain high-quality steels.

Zinc

Altogether the western hemisphere produces about 1.2 million tons of zinc in a year, most of it smelted in the United States. Canada's large volume of production goes chiefly into munitions being made in this country, and in the United Kingdom.

To meet the heavy demand for Allied war production, severe curtailments were in effect in 1942. The progress of the curtailment is shown by these figures:

	Essential and War use Per cent	Other uses Per cent
1940	36	64
1941	75	25
1942 (estimate)	95	5

In Canada there are only two producers of primary zinc, and the selling agency of both companies is the same.

The curtailment of domestic consumption of zinc in Canada was started in May, 1941, at which time the Metals Controller called together representatives of the following industries: Die casting, galvanizing, battery manufacture, paints and congoletum, rubber, and cables.

While the use of zinc oxides in paints has been set at approximately 50 per cent of the estimated 1940 requirements, paint manufacturers were notified on July 1, 1941, that the objective is the elimination of zinc oxide paints except for essential services.

Arrangements were made at the same time through the National Research Council for a substantial reduction of zinc oxide specifications in paint compounds in Government contracts.

On July 9, 1941, under M.C. 2, a Zinc Oxide Committee was formed.

On September 24, 1941, galvanizing of steel pipe was confined to certain sizes, with the exception of requirements for the navy and for merchant ships.

On October 1, 1941, galvanizing of pipe fittings was confined to certain sizes with the exception of requirements for the navy and for merchant ships.

On October 8, 1941, M.C. 5 set up a committee on the use of metal by lithographers. Steps were then immediately taken to curtail the use of zinc.

On October 8, 1941, M.C. 6 set up a committee on the use of zinc and copper in photo-engraving. Immediately afterwards steps were taken to curtail the use of zinc and copper by these industries.

On December 16, 1941, galvanizing of drainage fittings was prohibited except for certain war purposes.

On February 16, 1942, instructions were issued stating that all orders for zinc for lithographer's plates must be accompanied by a declaration that the order for metal is within the quota allotted.

On February 24, 1942, all sales of virgin zinc were prohibited, except under permit by the Controller.

On March 4, 1942, effective March 9, 1942, all trading in zinc ingots, (also copper, brass, bronze, and other copper alloy ingots) was prohibited, except under permit. The instruction applied whether the ingots were made from virgin metal, from a mixture of virgin and scrap, or from scrap only.

On March 5, 1942, dry battery manufacturers were instructed to discontinue, as of March 16, the manufacture of dry batteries for portable radios.

On May 11, 1942, M.C. 12 consolidated all previous instructions. It prohibited the acquisition of zinc (including metallic zinc, zinc oxide, zinc dust, and zinc die-casting alloys) except under permit. It established annual quotas as follows:

1. Galvanizing (other than wire fencing)—80 per cent of the zinc used for galvanizing (other than wire fencing) in 1940.
2. Galvanizing wire fencing—70 per cent of the zinc so used in 1940.
3. Dry batteries—81 per cent of the zinc so used in the year ended May 31, 1941.
4. Paint—50 per cent of the zinc oxide so used in 1940.

Except under permit, the order prohibited the following uses of zinc:

1. Galvanizing pipe or pipe fittings other than in sizes $\frac{1}{2}$ -inch to 2-inch.
2. Galvanizing drainage fittings.
3. Manufacturing dry batteries for portable radios.
4. Flashings on buildings.
5. Terrazo spacers and decorative strips, except for hospital operating rooms and rooms in which X-ray machines are used.
6. Manufacturing cosmetics.

On June 9, 1942, a directive was issued concerning the warehousing of zinc ships boiler plates. This control measure was designed to eliminate the possible duplication of stocks of this material and a chain of five designated warehousing establishments was set up to assure adequate supplies of these plates.

On June 19, M.C. 17 consolidated control over the use of zinc in the engraving industry. It set a quota of 75 per cent of the annual average between 1937 and 1940, inclusive, as the amount of zinc allowed to lithographers and 100 per cent as the amount allowed to photo-engravers.

Miscellaneous

On November 21, 1941, M.C. 7 established a Gas-Welding Non-Ferrous Metals Committee to regulate the distribution of welding rods for oxy-acetylene welding.

On December 1, 1941, M.C. 8 established a Lock, Builders' and Cabinet Hardware Metals Committee.

On January 19, 1942, M.C. 9 established a Jobbers and Distributors Advisory Committee.

On February 23, 1942, public utility companies were instructed that a permit must be obtained for the use of non-ferrous metals for the extension of gas, water, sewage, or power services. Exempted were: Installations for Dominion Government buildings and plants; installations for the Armed Services; emergency repairs and replacements; and essential electric installations calling for less than 500 feet of wire, where direct connection can be made to existing power lines. (A new instruction was issued on June 17, 1942.)

On April 20, 1942, M.C. 10 regulated dealing in non-ferrous metals scrap, effective April 30. It required smelters and ingot makers, and dealers selling or disposing of non-ferrous metal scrap to smelters, ingot makers, or foundries, to be licensed by the Controller.

Maximum prices for scrap were fixed at the maximum price at which each person sold the scrap in the period, September 15 to October 11, 1941.

On May 20, 1942, M.C. 10-A amended M.C. 10 by extending the definition of non-ferrous metal scrap to cover all types of copper bearing scrap, copper slags and copper drosses assaying and/or analyzing more than 40 per cent copper by weight.

On May 27, M.C. 15 established a War Metals Advisory Committee, to conduct investigations and make recommendations to the Controller with respect to the increased production of copper, zinc, lead, and other strategic metals and minerals, and the development of marginal and sub-marginal mining properties.

On June 17, 1942, a directive superseded that of February 23 to the public utility companies. The new instruction prohibited, except by permit, the use of non-ferrous metals for extensions or additions in public electric utility service unless related to military needs, war production, public health or safety, and then only where direct connection could be made to existing lines, leads, or mains, and if less than 250 feet of circuit or line were required. Necessary maintenance and emergency repairs were not restricted.

On June 22, 1942, M.C. 19 provided that except by permit:

No person shall remove, extract, dig, or dredge from any mine owned or controlled by him a greater monthly tonnage of ores containing metals than the average monthly tonnage removed during the four months of January, February, March, and April, 1942;

No person shall operate any mine owned or controlled by him to carry on any development work therein for the purpose of producing metals, unless such mine was in production, and unless metals or ores containing metals were being marketed from such mine commercially at the date of the order;

No person shall in any mine owned or controlled by him, carry on any development work such as shaft-sinking, drifting, cross-cutting, raising, or winzing at a rate in excess of the normal rate for the tonnage permitted to be removed from such mine. Purpose of this order was in no way designed to curtail the production of base metals and strategic minerals. -

On July 15, 1942, M.C. 20 provided that no person may sell, deliver, purchase, or acquire any sphagnum peat moss originating in British Columbia without a permit.

On July 30, 1942, M.C. 22 prohibited the use of non-ferrous metals in the manufacture of organs, except that non-ferrous metals may be used if employed in the form of wire or cable and to a value not in excess of one per cent of the manufacturer's cost price of the organ.

On September 1, 1942, M.C. 24 regulated the purchase and supply of metal ingots of copper, zinc, brass, bronze, or other copper alloy, aluminum, or aluminum alloy.

On November 12, 1942, M.C. 33 established a Non-Ferrous Wrought Alloys Advisory Committee.

MOTOR VEHICLE CONTROL

The hard-riding dragoons, dashing lancers, galloping artillery, and balky mules, which provided so much of the colour and vocabulary of earlier wars, have all been outmoded by the cold-steel efficiency of mechanized transport. To make way for the manufacture of this mechanical transport, and to conserve precious raw materials and manpower, Canadian production of automotive vehicles for the civilian was stopped early in 1942.

As a result of this change in production, Canada was faced with a shortage of civilian trucks and with an even more serious shortage of the skilled garage mechanics needed to keep existing equipment on the road.

To meet this situation, the Motor Vehicle Controller, acting as Administrator of the Wartime Prices and Trade Board under extended powers granted to him in November, ordered garagemen to place repair work on a straight priority basis, in this order of preference:

1. Any motor vehicle operated by the Armed Forces of Canada and her Allies, the R.A.F., the Ferry Command, or the Auxiliary War Services.
2. Any fire truck, police vehicle, truck, bus, ambulance, tractor, commercial motorcycle, or any other commercial vehicle; any motor vehicle for which a gasoline ration book other than "AA" has been issued (See Oil Control); or any motor vehicle for which the operator holds a Wartime Industrial Transit Plan gasoline ration book (See Transit Control).
3. Any motor vehicle for which an "AA" gasoline ration book has been issued.

In addition, the Motor Vehicle Controller arranged with National Selective Service, under the Department of Labour, for high labour priority ratings on garage mechanics doing essential work and thus made it easier for garages to maintain a fuller complement of skilled help.

The ban on the making of trucks and buses went into effect on March 14, 1942. At that time 2,000 chassis for

such vehicles had been fabricated but not assembled. Since then all these chassis have been completed and sold under essentiality certificates of the control. One thousand went to the Department of National Defence, 750 to the builders of the Alaska highway, and 250 for such activities as the construction of defence works and airdromes, lumbering, the Red Cross, public utilities, railway and airline pick-up and delivery, bus transport, public health, fire protection, policing, and air training.

By the end of 1942, all trucks not on the used car lots were actively serving their owners or undergoing repairs, and their civilian use was under strict control, particularly as regards mileage, by the Administrator of Services, Wartime Prices and Trade Board. With no new civilian manufacture permitted, would-be buyers had to depend on the supply of second-hand trucks which had dwindled to fewer than an estimated 1,200. If, however, no suitable used trucks were available, a highly essential purchaser could obtain, under a control permit, a chassis which otherwise would be completed for use as a military vehicle. By the same token, no new Canadian chassis for use as a bus could be released except at the expense of the Armed Forces, and then only with the approval of both the Transit Controller and the Motor Vehicle Controller.

With passenger cars the situation was somewhat different. The no-production order was passed in February, 1942, but assembly was permitted on a quota basis until April 1. To take care of the needs of physicians, nurses, firefighting and police departments, and others in the essential class, 4,480 new cars were set aside for a Government "bank," and were carefully stored away by dealers centrally located all across Canada. In addition, between 4,000 and 5,000 other new passenger cars, not earmarked for this reserve, were in dealers' hands at the beginning of April, and could be sold to anyone able to convince the dealer that his need was essential.

Had it not been for a flood which inundated Halifax early in October, the Government "bank" would not have been drawn upon during 1942. In a dealer's basement in that city eight of the "bank" cars were so thoroughly

drenched that they had to be taken to pieces, dried, freed of rust, put together again, and sold to essential users.

Of the "bank" cars there were thus available, at the beginning of 1943, a total of 4,472. Of the dealers' cars only 1,200 remained, and not one of these was left in Alberta, few in Saskatchewan, and fewer still in Nova Scotia. Used cars, on the other hand, were in good supply. Some 15,000 were on the lots throughout Canada, and other thousands could be readily purchased from owners who lacked special tire and gasoline privileges.

During 1942, the Controller established ceiling prices on all types of automotive vehicles.

In May, 1942, he reached an agreement with Washington under which, upon his approval as to essentiality in the Canadian war program, trucks of 16,000 pounds gross rating or over would be exported to Canada on a quota basis.

The Motor Vehicle Controller was appointed on February 13, 1941, under P.C. 1121. On December 23, 1941, under P.C. 9973, a Deputy Controller was appointed. The chronological record of the Control activities is as follows:

On March 21, 1941, Order M.V.C. 1 determined that if an importer was not manufacturing in Canada on December 2, 1940, he could not start to manufacture and make more cars than he could import under his quota of 20 per cent of 1940 U.S. money value.

On May 5, 1941, M.V.C. 2 directed that no automobile manufacturing company could make passenger automobiles in Canada after May 31, 1941, unless a licence was obtained.

On May 5, 1941, M.V.C. 3 curtailed by 20 per cent the production and sale of passenger cars during the period of April to December, 1941, as compared with the same period in 1940.

On June 28, 1941, M.V.C. 4 prohibited the manufacture of white wall tires.

On August 27, 1941, M.V.C. 5 set the rate of production of passenger cars for 1942 at 44 per cent of the 1940 production, the equivalent of 50 per cent of the 1941 production. The order spread production evenly throughout the year at the rate of not more than one-tenth for any one month.

On November 28, 1941, M.V.C. 6 prohibited the manufacture of trucks after January 1, 1942, except under licence.

On November 28, 1941, M.V.C. 7 limited truck production (except for defence orders and for export) during the last quarter of 1941 to a quota based upon production estimates previously filed with the Controller by manufacturers.

On December 1, 1941, M.V.C. 8 reduced, except for defence orders and for export, the production of trucks in 1942 to the following limits: (a) Trucks under 10,000 pounds gross rating, 50 per cent of 1941 production; (b) Trucks of 10,000 tons gross rating or over, a number equivalent to 1941 production. The order also called for the spreading of production evenly throughout the year.

On December 1, 1941, M.V.C. 9 prohibited after January 15, 1942, the use of bright metal finish or body trim, containing copper, nickel, chrome, or aluminum, in the manufacture of motor vehicles, trailers, parts, or accessories, except under permit by the Controller.

On December 15, 1941, M.V.C. 10 prohibited any person making motor vehicles or trailers from selling, supplying, or equipping any motor vehicle or trailer with a spare tire or a spare tube except on defence orders, or by permit of the Controller.

On January 15, 1942, M.V.C. 11 established a Motor Vehicle Dealers' Advisory Committee.

On January 15, 1942, M.V.C. 12 established a Motor Vehicle Manufacturers' Advisory Committee.

On February 2, 1942, M.V.C. 13 prohibited after April 1, the production sale, or delivery by manufacturers of passenger motor vehicles except under permit by the Controller. Between January 1 and March 31, production was restricted to a quota based upon estimates of production previously filed with the Controller by manufacturers. The production of vehicles with seating capacity for more than ten persons, or of vehicles for war orders, was not covered by this order.

On February 18, 1942, M.V.C. 14 authorized vendors of motor vehicles to discontinue the granting of "fleet discounts" to buyers. It also authorized the discontinuance of discounts on the sale of parts, except when sold to operators of repair garages for use in such garages.

On February 24, 1942, M.V.C. 15 fixed, as of March 16, maximum retail prices including delivery and servicing charges at the time of the sale of motor vehicles and equipment. It provided that no person shall sell a motor vehicle at a price in excess of the retail price that has been established by each manufacturer, with the concurrence of the Wartime Prices and Trade Board, and filed with the Controller, for delivery of such a vehicle f.o.b. factory (or f.o.b. the chief place of business in Canada of an importer), plus the following maximum charges:

1. Transportation charges to the dealer's location, at a rate not exceeding a schedule of transportation charges established by manufacturers and approved by the Controller.

2. A servicing charge of \$25 for passenger vehicles with seating capacity for ten persons or less, and \$35 for all other motor vehicles, for which the following services and supplies shall be provided: Unloading and handling; mechanical inspection; washing and polishing; filling transmission and differential with oil and greasing generally; filling the motor with oil other than gasoline, preparing for delivery to the purchaser and all the factory recommended "get ready" and "delivery" preparations.

3. A charge for optional equipment or accessories.

On March 9, 1942, M.V.C. 16 prohibited, as of March 14, all civilian truck production except under permit by the Controller. It repealed M.V.C. 8, of December 1, 1941, whereby civilian truck manufacturing quotas for 1942 had been established.

On March 28, 1942, M.V.C. 17 prescribed regulations governing the release of "reserve passenger motor vehicles," from the "bank" or reserve established by the Controller. Such an automobile may be sold only to a person holding a permit from the Controller, and permits will be granted only on proof of necessity.

The maximum price at which a dealer or a storing dealer (defined as a dealer with whom a reserve passenger motor vehicle has been placed for storage) may sell a reserve passenger motor vehicle to a customer shall not be greater than the sum of the following:

1. The maximum prices and delivery servicing charges established in M.V.C. 15.

2. A storage and storing finance charge of \$12 to \$13 per month (varying with the type of vehicle) for each month or fraction of a month subsequent to April 30, 1942, during which such vehicle was held in storage by the storing dealer.

If a dealer who is not a storing dealer sells a reserve passenger motor vehicle to a consumer, the selling dealer may sell only a vehicle of the make and model for which he is an authorized sales agent. The reserve passenger motor vehicle may be obtained by the selling dealer from the storing dealer after its release has been authorized by the finance company owning the vehicle, and on payment to the storing dealer of the following:

1. The wholesale price at base discount established for the selling dealer by the manufacturer.

2. Charges for transportation, handling and servicing, and for optional equipment, as specified in M.V.C. 15.

3. Compensation of \$50 for the use of the storing dealer's facilities and storing services.

4. Storage and storing finance charges of \$12 to \$13 per month for each month or fraction of a month during which such vehicle was held in storage by the storing dealer.

On May 12, 1942, M.V.C. 18 established ceiling prices on initial retail sales of passenger motor vehicles other than current models, and on used passenger motor vehicles. It provided that no person shall sell a passenger motor vehicle if the first sale of such vehicle to a consumer, at a price in excess of that prescribed under M.V.C. 15 for the sale of a 1942 model of the same make and type, and with the same optional equipment or accessories.

On June 10, 1942, M.V.C. 20 provided that effective June 17 no person shall put into process, and effective July 1 no person shall use rubber or any metals in the production of any accessories for any motor vehicle or trailer (except heaters, defrosters, and accessories required by law). Effective June 17 no person shall put into process, and effective July 1 no person shall use, any copper or copper base alloy in the production of any accessories or any body fittings or body trim for any motor vehicle or trailer, except for parts necessary for conducting electricity.

On June 13, 1942, M.V.C. 21 prohibited the production of non-functional motor vehicle replacement parts, effective June 17. Starting with the months of May, June, and July, and continuing for each succeeding three-month period thereafter, the production of specified replacement parts is limited to 70 per cent of the value of such parts sold during the corresponding three months of 1941.

On June 30, 1942, M.V.C. 22 established a Motor Vehicle Automotive Parts Manufacturers' Advisory Committee.

On July 6, 1942, M.V.C. 19 established ceiling prices on new and used trucks. It provided that, for new trucks, the maximum retail delivered prices must not be higher than the 1942 retail price at the factory as approved by the Motor Vehicle Controller, plus a transportation charge and a charge of \$35 for necessary services in preparing the vehicle for delivery. Allowance was also made for any accessory or option in addition to standard equipment, provided it is not higher than the 1941 retail price for such articles or option.

The price ceiling for used trucks was based on a sliding scale for depreciation, depending on the length of time the trucks have been in service. Transportation charges, however, were established on a uniform basis for each of the provinces and for different sections of Ontario. Where there is no truck of the 1942 model of the same type and make as the truck being sold, the maximum price for a truck is calculated from the price of the most nearly similar 1942 model.

On August 15, 1942, M.V.C. 23 ordered that all buses made after that date be painted a colour known to paint manufacturers as Khaki Green No. 3 Glossy.

On September 4, 1942, M.V.C. 11A amended M.V.C. 11 by adding a member to the Motor Vehicle Dealers' Advisory Committee.

On September 5, 1942, M.V.C. 21A restricted the production of specified replacement parts during any three-month period, starting with August, September, and October, for passenger motor vehicles, trucks and buses.

The order also required the return of used parts.

On November 28, 1942, M.V.C. 11-B revised the membership of the Motor Vehicle Dealers' Advisory Committee.

OIL CONTROL

Canada entered 1943 with low inventories of oil. With an increase in the tempo of the war, the demand for the Armed Forces was revised upwards, more of the United Nations tankers had to be diverted to direct war use, and the replenishment of supplies was becoming increasingly difficult.

To meet the situation, the nation-wide gasoline rationing system, introduced in April, 1942, was being revised; and owners of industrial, institutional, and commercial buildings were being warned that no more temporary permits for the use of fuel oil would be issued after January 15, 1943.

Previously the use of fuel oil for heating such buildings or for making steam, had been prohibited, but the shortage of coal-burning equipment had made necessary the issuance of temporary permits. By the end of 1942 a total of 9,000 buildings, including hospitals, schools, theatres, restaurants, apartment houses, warehouses, stores, and factories, had converted to the use of coal, with a resultant saving of more than 100 million gallons of oil per year. In addition, many home owners had voluntarily made the same change-over.

During 1942, the value of the ration coupon, which began at five gallons, had been progressively reduced until it stood at three gallons all across the country. In October all non-essential aircraft had been grounded. In November taxis were rationed. And for more than a year service stations had been restricted in their hours of sale, the octane rating of saleable gasoline had been reduced, and only two grades of gasoline had been sold for use in motor vehicles.

In addition, the use of asphalt, a petroleum product, had been very strictly curtailed in June, 1942. Its use in paving had been confined to direct war purposes, and its use for roofing materials and linoleum had been cut in half. As a result approximately 30 per cent of the fuel oil formerly used as asphalt was diverted to the navy and to other war uses.

On the supply side of the picture, here are some of the factors which made the oil position of Canada so serious at the beginning of 1943:

1. The advance in Egypt and Lybia, and the opening of a new front in northwest Africa, called for enormous quantities of oil, great numbers of tankers. At the same time other vital fronts, including those in the Pacific, have had to be supplied.

2. The spread of the war in the Pacific has cut off Far Eastern sources, and made necessary the use of an increasing number of tankers on long hauls. The more tankers there are tied up in long hauls, the fewer there are to begin new hauls, and hence, in effect, the fewer tankers there are available to Canada and her Allies.

3. The submarine menace has not lessened. At the end of 1942 it was reported that Germany was building submarines as fast as, or faster than, they were being sunk. At one period in 1942, enemy action was so serious a threat that all tankers in the Gulf of Mexico and Atlantic service had to be held in port for twelve consecutive days. During July, 1942, not one tanker reached Halifax.

4. To meet this submarine menace, it has become necessary to convoy tankers, their speed has been thus reduced, and hence more have been needed to carry the same quantity of oil in any given period.

5. Ordinarily more than 50 per cent of Canada's crude oil comes in by ocean tanker. Many of the tankers owned in Canada or leased to Canadian firms have been sunk since war began.

6. Replacement tankers from time to time had been obtained from other United Nations, but several of these replacement tankers were at the bottom of the Atlantic or the Pacific.

7. Because of the shortage of steel, copper, and other raw materials, and the scarcity of manpower on this continent, additional replacement tankers were hard to obtain.

8. Scores of Canadian tankermen had lost their lives, and scores more had been badly burned, or frozen, or wounded by enemy action.

On the consumption side of the picture, the situation was equally difficult. In 1938, the last full year of peace, Canada used 44 million barrels of crude oil. During the 12 months ended June 30, 1942, she used 63 million barrels, an increase of 42 per cent. Here are some of the reasons for the current increase:

1. Canada's navy rose in strength from 15 ships before the war to more than 400 in December, 1942. For these ships she needed many more millions of gallons of oil per year than she needed in 1938.

2. In one division of the army, 15,000 men, there are as many motorized units as in Canada's whole army of 150,000 in the field during the first world war. Hence the need for more petroleum.

3. Canada had no warplanes of her own in the first Great War. Shortly thereafter she obtained the nucleus of an air force. In January, 1943, she had thousands of planes, and each plane used eight times as much gasoline as the old-type aircraft. Requirements of aviation gasoline in December, 1942, were approximately 16 times what they were in 1940, and many more times those of 1938.

4. Canada's industrial production, because of the war, is roughly double what it was in 1938. Modern machinery uses great quantities of oil. The demand for this purpose runs into many millions of gallons per year.

The problem of oil shortage is chiefly one of transportation. Large oil fields exist in North and South America, but the transportation facilities are not sufficient to move all that is needed. During the twelve months ended June 30, 1942, ocean tankers brought in 40.8 per cent of the crude oil which entered Canada, and lake tankers carried 23.2 per cent. The amount pumped by pipeline from mid-continent fields in the United States was 17.2 per cent, and 1.2 per cent came in by rail. The balance, 17.6 per cent, represented Canadian production.

To most laymen the words "crude oil" and "petroleum" convey the idea of motor car gasoline. Before the war such an interpretation was more or less correct, but today the manufacture of motor car gasoline is just a sideline, subordinated to the production of the petroleum requirements of the war program. In cracking the crude oil, the refineries now concentrate largely on obtaining fuel oil and aviation gasoline. For example, the refinery in Halifax since January, 1942, has been occupied almost entirely with the production of fuel oil for the navy and the merchant marine, and in that period motor car gasoline has represented only about eight per cent of its output.

Historical

Shortly after the outbreak of war an inventory was made of the productive capacity of Canadian oil wells and refineries so that Canadian facilities could, as far as possible, be utilized. The output of the Turner Valley in Alberta was boosted by 27 per cent to its highest practicable point, but by the end of 1942 this production rate had declined slightly.

On June 28, 1940, under P.C. 2818, an Oil Controller was appointed.

At the suggestion of the Controller, runs in certain refineries were changed to give a maximum yield of fuel oils. Gasoline in these refineries became a by-product. In other refineries the runs were not changed to the same extent, because they draw crude oil by pipeline from U.S. mid-continent fields where a heavy crude cannot be obtained.

A seven-man advisory committee was appointed by the Minister of Munitions and Supply. It comprises the president of each of the eastern refineries, and a representative of the largest importer of gasoline. A similar committee was formed on the Pacific coast.

In addition, the Oil Controller formed committees of the industry to assist him in dealing with specific technical problems.

Late in 1941 the oil inventory was dropping, and the demand for war purposes rising. A campaign for voluntary reduction of gasoline consumption proved to be

inequitable, and rationing became necessary. The rationing plan was put into effect on April 1, 1942. Vehicles were divided, according to their degree of essentiality, into categories, but fifteen days later the situation had deteriorated to the point where the original categorization plan had to be revised downwards, and many thousands of vehicle owners were allowed smaller rations. Later this recategorization was again revised downwards, and after October 1, 1942, a new category, known as "AA" was established. Into this category more than 320,000 motorists were placed. As owners of less essential vehicles they were allowed only from 16 to 20 units for the six months ending March 31, 1943.

On August 8, 1940, Order O.C. 1 prohibited, except under permit, the establishment of further service stations throughout Canada and prohibited, except by permit, the sale or installation of additional gasoline pumps or storage tanks for retail sales.

On September 16, 1940, O.C. 2 prohibited the sale of fuel oil for any equipment which previously utilized other fuel. The order exempted equipment which did not use more than 4,000 imperial gallons per year. (This order was amended on June 24, 1941, and again on October 22, 1941.)

To relieve the shortage of oil in Eastern Canada a pipeline was constructed from Portland to Montreal by private interests. The oil started to flow on November 16, 1941.

On April 30, 1941, O.C. 3 prohibited any retail dealer from changing his distributors without a permit.

On June 24, 1941, O.C. 4 replaced and clarified O.C. 2.

On July 17, 1941, O.C. 5 restricted the hours of retail sale of gasoline to 7 a.m. to 7 p.m. on week days and prohibited all sales on Sundays except by permit. The order also eliminated credit cards. (This order was amended on October 1, 1941, under O.C. 9, and was modified in May, 1942, to permit service stations five or more miles from a city or town of 5,000 or more to remain open until 9 p.m. on Saturdays during May, June, July, August, September and October.)

On July 26, 1941, O.C. 6 eliminated credit sales for passenger motor cars. This order determined that gasoline for use in a passenger motor vehicle could be sold for cash only and must be delivered to the tank of such motor vehicle, and the dispensing of such fuel for such purpose to a can or other separate receptacle was prohibited.

On August 25, 1941, O.C. 7 placed deliveries of motor fuel to dealers' stations on a quota basis. For the period from August 25, 1941, to August 31, 1941, the quota was 20 per cent of the motor fuel supplied to the dealer in July, 1941. For September and October, 1941, it was 75 per cent of the July total. Dealers were required to give preference to:

1. Vehicles operated for public health and safety, including police, fire, and public utility maintenance vehicles.
2. Ambulances and physicians' and surgeons' vehicles.
3. Public transportation vehicles and vehicles operated for commercial, industrial, and agricultural purposes.
4. Vehicles owned and operated by Dominion, provincial, and municipal governments.

Dealers were prohibited from switching from one source of supply to another, except by permit.

On September 26, 1941, O.C. 7A restricted to 20 per cent of the average quantity allowed in July, the gasoline which could be purchased by dealers after the last week in August. In September the dealers received 75 per cent of their July supply and in October the quota was set at 80 per cent of the deliveries in October, 1940, subject to minor adjustments. (Revoked on November 15, 1941.)

On September 26, 1941, O.C. 8A provided that only two grades of gasoline could be sold for use in motor vehicles after October 1, and also that purchasers of 20 gallons or more must be given a detailed invoice. The new No. 1 grade rates between 75 and 78 octane, as compared with an average of about 79 octane for the former premium grade. The new No. 2 grade rates between 66 and 70, as compared with about 72. The order also provided that no gasoline could be placed in a passenger car except by an established service station or dealer.

On October 1, 1941, O.C. 9 amended O.C. 3 to allow the distributor or dealer to lend pumps or tanks to a consumer engaged in Government or municipal construction work or in construction work authorized by the Controller of Construction. It relaxed O.C. 5 so that closing hour restrictions do not apply in the instance of sale of fuel for use in connection with public construction work by Dominion and provincial governments. On December 10, the exemption was broadened to allow dealers to supply gasoline after hours for all essential services to public highways, including snow removal and sanding.

On October 1, 1941, the Oil Controller authorized price increases of one cent for grade No. 1 and grade No. 2 gasoline in Ontario, Quebec, and the Maritime Provinces, and an increase of $\frac{1}{2}$ -cent a gallon on light fuel oil and 10 cents a barrel on heavy fuel oil in Ontario, Quebec, and the Maritime Provinces, Manitoba, Saskatchewan, and Alberta.

On October 21, 1941, O.C. 10 confirmed the established price ceilings on petroleum products, and at the same time prohibited the sale and purchase of motor fuel by public or private tender.

On October 22, 1941, the Oil Controller ruled that the provision of O.C. 4 limiting the installation of new oil consuming boilers or furnaces would not apply to diesel oil or diesel engines. The order also does not apply to kerosene and stove oil or equipment.

On October 25, 1941, O.C. 7B clarified O.C. 7 and O.C. 7A by defining more specifically the amount of gasoline allowed to each dealer.

On November 15, 1941, O.C. 7C revoked O.C. 7, O.C. 7A, and O.C. 7B and thus discontinued service station quotas. The new order retained provisions preventing dealers from changing their sources of supply.

On December 13, 1941, by memorandum, the Controller suspended the requirements of certain paragraphs in O.C. 10, and thus permitted the sale of motor fuel by public tender and removed the compulsory differential of 1c per imperial gallon between tank-wagon prices to consumers and dealers.

On January 28, 1942, O.C. 10A rescinded O.C. 10 and authorized price increases of $\frac{1}{2}$ c per imperial gallon for light fuel oil and 25c per barrel for heavy fuel oil in the Province of British Columbia above prices in effect on September 30, 1941. It also re-authorized price increases which had been in effect in all provinces except British Columbia under O.C. 10.

On March 19, 1942, the Controller instructed 725 owners in British Columbia of municipal buildings, schools, churches, hospitals, office buildings, theatres, restaurants, institutions, apartment houses, and other buildings (not private homes) to switch from oil to coal for heating.

On April 7, 1942, a similar instruction was sent to 165 industrial and commercial buildings. (See also May 6 order.)

On May 1, 1942, by order-in-council, a speed limit of 40 miles an hour was set for the whole of Canada. This was to save gasoline, rubber, and steel. Penalties: First offence, not less than a \$15 fine, not more than a \$50 fine, or up to 10 days, or both fine and imprisonment; second offence, not less than \$25 nor over \$100 or up to 15 days, or both; subsequent offence, not less than \$50, nor over \$200, or up to 30 days, or both.

On May 6, 1942, more than 600 owners of heating plants (not private homes) east of the Rockies were ordered to switch from oil to coal.

On May 23, 1942, O.C. 5A amended O.C. 5. It provided that during the months of May, June, July, August, September, and October of any year, any

dealer's station which is not in, or within five miles of, the limits of any city or town with a population of 5,000 or over may remain open for business up to 9 p.m. on any Saturday.

On June 1, 1942, O.C. 14 prohibited, except by permit, the use of asphalt for the construction, maintenance, or repair of any road; for the making of any roofing materials, including building paper and building felt; or for the making of briquettes, or of linoleum or oilcloth.

The Controller announced that the order would be applied as follows:

1. No oil would be released for use as road oil.
2. No asphalt could be used for constructing new provincial, municipal, or private roads, but some would be released for certain essential war purposes such as airports and parade grounds.
3. Asphalt for making roofing shingles, and other roofing materials, on a 50 per cent quota.
4. Asphalt for linoleum or oilcloth on 50 per cent quota.
5. Because of the threatened fuel shortage, no restriction on the use of asphalt for making coal briquettes.
6. No restriction on use of asphalt for making wooden storage battery boxes, which could no longer be made of rubber.

On June 26, 1942, provisions of O.C. 12, allowing dealers a margin of 1½ per cent for wastage by handling and evaporation, were extended to commercial users.

On July 22, 1942, O.C. 15 provided that on and after July 23 no producer shall sell or consume any benzol, and no person shall blend or use any benzol, without a permit.

On September 1, 1942, O.C. 4A, rescinding O.C. 4, established restrictions on the installation of oil-burning equipment and the use of "burning oil" therein. It provided that, without a permit, no person shall install or replace any oil-burning engine, boiler, furnace, or stove, or put into use any such equipment which was not fueled with burning oil on September 1, 1942. This restriction did not apply to:

- (a) Installation, replacement, or use of any oil-burning engine as follows:
 - (i) By a farmer for use in farming operations.
 - (ii) For the operation of any naval or mercantile vessel.
- (b) Installation, replacement, or use of any domestic kerosene stove.

The order also provided that, without a permit, no person shall sell or supply to a consumer, and no consumer shall purchase, acquire, or consume any burning oil for the fueling of any oil-burning engine, furnace, or stove. This restriction did not apply to the acquisition or use of burning oil:

- (a) By a farming for farming operations.
- (b) For the heating of any private dwelling, containing not more than two self-contained apartments used exclusively as a residence, or the heating of water for domestic purposes therein.
- (c) For the operation of any naval or mercantile vessel.
- (d) For the operation of any domestic kerosene stove.

The acquisition or use of kerosene, No. 1 stove oil or distillate, may continue in the case of any oil burning engine, boiler, furnace, or stove which installed, and was so fueled, as at July 1, 1942.

O.C. 4A provided further that no person, including a consumer, shall increase the capacity of facilities owned or controlled by him and used for storage distribution of burning oil.

On October 1, 1942, O.C. 16 grounded all non-essential aircraft. The order provided that, except for the Armed Forces and certain other essential operators, no person may use any petroleum product for any type of aircraft unless he has a permit from the Controller.

Specific exemptions from all provisions of the order were:

1. Aircraft of the Armed Forces of Canada and her Allies.
2. Aircraft operated under the Combined Training Establishment, whether owned privately or by the Government. (The Combined Training Establishment comprises all R.A.F. and R.C.A.F. air training units in Canada.)
3. Any scheduled air transport service licensed by the Board of Transport Commissioners or the Department of Transport.

The Controller announced his intention of considering the granting of permits for such essential aircraft services as:

1. Necessary Government services, both Dominion and provincial, and including forestry patrols.
2. Non-scheduled air transport services to outlying districts otherwise inaccessible.
3. Essential mining and exploration.
4. Aerial photography for surveys approved by the Department of Transport after consultation with the Department of National Defence.
5. Testing of aircraft or aircraft engines by manufacturers.
6. Pilot training for essential civil and commercial services.

On November 27, 1942, O.C. 17 provided that, without a permit from the Controller, no person was permitted to use any petroleum product for lighting in any "Power Shortage Area" for:

- (a) Interior or exterior sign lighting (whether commercial or non-commercial);
- (b) Interior or exterior show window or show-case lighting;
- (c) Interior or exterior outline or ornamental lighting;
- (d) Interior or exterior lighting for decorative or advertising purposes;
- (e) The lighting of any theatre, music hall, or concert hall, in which there are facilities connected with a supplier for lighting by the use of electricity or gas, or of any entrance to or exit from such place or of any passageway leading from the street to the body of such place; provided that nothing contained in this paragraph (e) shall be deemed to prevent the temporary emergency lighting of such place in the case of the failure of the electric current or gas by which it is ordinarily lighted.

No supplier was allowed to supply any petroleum product for purposes that he knew to be in contravention of this order.

(Note: "Power shortage areas" are as set forth by the Power Controller in his Order P.C. 5, September 20, 1942.)

Rationing

On March 4, 1942, O.C. 12 established gasoline rationing effective on April 1, 1942. Late in 1942 the Minister of Munitions and Supply indicated that a revision of the rationing system would be established in the new rationing year, beginning April 1, 1943. Under the new system a basic ration will be granted for every non-commercial vehicle, and additional coupons will be allowed those whose extra needs are shown to be in line with the successful prosecution of the war.

Under the original plan, every vehicle owner had to register with the Controller and obtain at a cost of \$1 a gasoline licence and ration book. Each book permitted

the purchase of a designated number of units of gasoline, according to the category of the vehicle for which it was issued. At the outset of the plan the unit represented the right to purchase five gallons of gasoline. After progressive reductions, the unit value on January 1, 1943, was three gallons.

Under the April 1, 1942, plan every vehicle was classified under one of the following seven categories:

CATEGORY A

All vehicles not eligible for any other category.

CATEGORY B

Occupation

Rural school teachers.
Farmers who do not possess a truck.
Clergymen.

Urban undertakers.
Urban veterinary surgeons.
Members of A.R.P. or auxiliary fire or police organization.

CATEGORY Bx

Employees of industrial plants and of flying schools under the Combined Training Establishment, if

such plants or schools are not adequately served by alternative forms of transportation.

CATEGORY C

Employees of industrial plants and of flying schools under the Combined Training Establishment if such plants or schools are not adequately served by alternative forms of transportation and are located more than 20 miles from their residence.

Government officials who drive their own cars on government business.

Urban commercial travellers.

Operating executives of companies engaged in the execution of war contracts who produce a written request from the Secretary of the Department of Munitions and Supply

for inclusion in Category "C."

Newspaper reporters.

Press photographers.

Railway employees who are required to use their cars on company business.

Physicians and surgeons.

Christian Science practitioners.

Drugless healers.

Rural undertakers.

Rural veterinary surgeons.

Incapacitated individuals, if car required for normal conduct of business.

Consuls and vice Consuls of career.

Trade Commissioners and Assistant Trade Commissioners.

CATEGORY D

Government auditors and inspectors who drive their own cars on government business.

Officers, field secretaries, and nurses of the Canadian Red Cross

Society or organizations which are members of the Canadian Welfare Council or other similar bodies, including religious orders engaged in welfare work.

CATEGORY E

Rural commercial travellers.

Rural Mail Delivery Contractors.

Official cars of the Inspection Board of the United Kingdom and Canada.

Members of accredited foreign Naval, Military and Air Force Missions.

Official cars of the United Kingdom and other Empire air liaison missions.

Members of the Diplomatic Corps eligible for inclusion in the Diplo-

matic List published by the Department of External Affairs.

Members of High Commissioners' Offices and accredited representatives' offices eligible for inclusion in the "List of British Commonwealth Representatives in Canada" published by the Department of External Affairs.

Consuls General of career.

Others accorded full diplomatic privileges by treaty or by the Department of External Affairs.

CATEGORY "COMMERCIAL"

Trucks (including farm trucks).
(Farm and industrial machinery not required to be licensed or registered for highway use need not be registered.)

Truck tractors.
Commercial motorcycles.
Ambulances.
Buses.
Taxicabs, livery cars, and drive-

yourself cars regularly used and registered for such use.

Vehicles owned or operated by companies operating flying schools under the Combined Training Establishment.

Official vehicles of Dominion, provincial, county, and municipal governments.

(Note: Commencing on April 15, 1942, many of these categories were changed. Salesmen and many other classes of business drivers were reduced to Category "A." On October 1, 1942, the categories were again changed.)

Under each category, with the exception of "Commercial," three classes, grouping the makes of cars, were provided, to each of which was assigned a different number of units. These were:

Class one: Ajax, American Bantam, Austin, Bean, B.S.A. Scout, Chevrolet, Chrysler (all models for year 1933 and before 1933, except Imperials), Citroen, Cleveland, Diana, Dodge, Durant, Erskine, Falcon-Knight, Fiat, Ford, Frontenac, Gardner, Hillman, Jewett, Jordon, Lafayette, Marquette, Maxwell, M.G. Morris, Morris-Crossley, Morris Cowley, Morris Oxford, Nash (600 Special and 600 de Luxe only), Oakland, Plymouth, Pontiac 6, Raleigh, Riley, Rockne, Rover Singer, Standard, Star, Studebaker (models Champion and Champion de Luxe only), Terraplane, Vauxhall, Velie, Viking, Whippet, Willys, Willys Overland, Willys Knight, Willys American, Wolverine.

Class Two: Auburn, Black Hawk, Chandler, Chrysler (all models 1934 to 1942 inclusive, except Imperials and New Yorker), De Soto, Elcar, Flint, Franklin, Graham-Paige, Hudson, Hupmobile, Lexington, Lincoln Zephyr, Marmon, McLaughlin-Buick (all models except 60s, 70s, 80s, 90s), Mercury, Moon, Nash (all models except 600 Special and 600 de Luxe), Oldsmobile, Packard, 6 Paige, Peerless, Pontiac 8, Reo, Rickenbacker, Roosevelt, Studebaker (all models except Champion and Champion de Luxe), Wills St. Clair.

Class Three: Armstrong Sidley, Cadillac, Chrysler (all Imperial Models and the New Yorker), Cord, Duesenberg, La Salle, Lincoln, McLaughlin-Buick (all 60, 70, 80 and 90 models), Mercedes, Packard 8 and 12, Pierce Arrow, Renault, Rolls Royce, Stearns Knight, Stutz, Wolsley.

Units of gasoline allowed vehicles in each class of each category were as follows:

CATEGORY A

Class 1—60 units per annum
Class 2—68 units per annum
Class 3—76 units per annum
Class 4—24 units per annum
(Motorcycles)

CATEGORY B

Class 1—88 units per annum
Class 2—100 units per annum
Class 3—116 units per annum

CATEGORY Bx

Class 1—132 units per annum
Class 2—148 units per annum
Class 3—172 units per annum

CATEGORY C

Class 1—168 units per annum
Class 2—188 units per annum
Class 3—216 units per annum

CATEGORY D

Class 1—280 units per annum
Class 2—312 units per annum

CATEGORY E

Class 1—388 units per annum
Class 2—436 units per annum
Class 3—500 units per annum

CATEGORY "COMMERCIAL"

(Purchases permitted as required.)

Fifteen days after the rationing system went into effect, the inventory position had become so serious that it was necessary to begin a downward revision of the preferred categories. Many thousands were affected.

By the end of the summer of 1942, this downward revision crystallized into a new categorization plan which became effective on October 1, 1942. Under the new plan the ration books of more than 320,000 motorists were recalled and these motorists were issued new books in a category known as "AA." This new category allowed the following maximum number of units per vehicle for the period from October 1, 1942, to April 1, 1943, provided the vehicle owner had that number or more of units left in his old book:

Motor vehicles in Class 1	16 units
Motor vehicles in Class 2	18 units
Motor vehicles in Class 3	20 units
Motorcycles in Class 4	3 units

The number of units allowed in each of the preferred categories was not changed, but those who applied for special gasoline privilege on or after October 1, 1942, if they could prove necessity, were categorized as follows:

CATEGORY A

Architects.
Auctioneers.
A.R.P. workers and members of auxiliary fire and police organizations who use their cars in connection with their duties.
Auditors.
Bond salesmen.
Cemetery officials.
Chartered accountants.
Chain store supervisors.
Employees of industrial plants not adequately served by alternative forms of transportation residing one to six miles from plant.

Employees of flying schools under the Combined Training Establishment, where living quarters are not provided or where adequate alternative forms of transportation do not exist, residing one to six miles from school.

Farmers who own a truck.
Hotel cars used for the transport of guests.
Lawyers.
Lumber merchants.
Summer and winter resorts.
Salesmen using car in pursuit of business.
Theatre supervisors.

CATEGORY B

Employees of industrial plants not adequately served by alternative forms of transportation residing from six to 10 miles from plant.
Employees of flying schools under the Combined Training Establishment, where living quarters are not provided or where adequate

alternative forms of transportation do not exist, residing from six to 10 miles from school.

Farmers who do not own a truck.
Members of Parliament.
Retail deliveries by passenger vehicle.
Window cleaners.

CATEGORY Bx

Bank inspectors.
Builders.
Credit reporters.
Employees of industrial plants not adequately served by alternative forms of transportation residing from 10 to 20 miles from plant.
Employees of flying schools under the Combined Training Establish-

ment, where living quarters are not provided or where adequate alternative forms of transportation do not exist, residing from 10 to 20 miles from school.

Garage service (when truck not owned).
Nurses on call.
Painters and decorators.
Prospectors.

CATEGORY C

Employees of industrial plants not adequately served by alternative forms of transportation residing more than 20 miles from plant.

Employees of flying schools under the Combined Training Establish-

ment, where living quarters are not provided or where adequate alternative forms of transportation do not exist, residing more than 20 miles from school.

Occupation

Bread delivery by car
Cattle drovers
Chemical manufacturers' engineers
Claims adjusters
Clergymen
Contractors
Dentists
Drugless healers
Engineers (professional)
Essential repairs and service
Finance company collectors
Food production supervision
Government officials (driving their own cars on government business)
Inspection Board of United Kingdom and Canada
Insurance investigators
Land surveyors
Licensed salvaged dealers
Live stock buyers
Lumber production
Machine tool technicians
Milk delivery by car
Mining machinery technicians
Mortgage company inspectors
Newspaper delivery
Newspaper reporters
Passenger-type vehicles of Dominion, provincial, county, and municipal governments
Physicians
Publishers
Press photographers
Rural mail delivery contractors (in discharge of contractual duties)
Surgeons
Teachers employed in rural schools
Transportation employees, using own cars on transportation service
Undertakers
Veterinarians
Wartime Prices and Trade Board investigators
Welfare workers

Where Business or Duties Require Applicant to Drive from Date of Application to April 1, 1943

3,000 to 6,500 miles	6,500 to 8,500 miles	8,500 to 12,500 miles	More than 12,500 miles
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A	B	Bx	C
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The original rationing order allowed tourists from outside Canada four units for a stay of up to 48 hours, 20 units for a stay of up to 90 days, and the opportunity of taking out a Category "A" book for a longer stay. Later this allowance was revised downwards and at the close of 1942 a tourist from outside Canada was allowed four units for any one car in a year, but if he were coming into Canada for war business purposes he could obtain a sufficient allowance to enable him to complete whatever business he might have to do in Canada.

By November 30, 1942, a total of 1,571,833 gasoline licenses had been issued. These were for 1,277,937 passenger cars, 291,529 trucks and other commercial vehicles, including taxis and drive-yourself cars, and 14,591 motorcycles. By that date the recategorization had been virtually completed, and the ration books issued were as follows:

Category	Sub-totals	Totals
AA Class 1	254,868	
AA Class 2	55,984	
AA Class 3	6,798	
AA Class 4	3,197	
		320,847
A Class 1	446,661	
A Class 2	81,610	
A Class 3	14,833	
A Class 4	9,027	
		552,131
B Class 1	266,931	
B Class 2	39,648	
B Class 3	4,014	
		310,593
Bx Class 1	46,590	
Bx Class 2	11,379	
Bx Class 3	1,672	
		59,641
C Class 1	23,487	
C Class 2	6,629	
C Class 3	1,288	
		31,404
D Class 1	2,228	
D Class 2	452	
D Class 3	88	
		2,768
E Class 1	445	
E Class 2	77	
E Class 3	31	
		553
Total Passenger		1,277,937
Commercial	291,529	
Commercial Motorcycle	2,367	
		293,896

The rationing plan also applied to water craft. Commercial water craft (See O.C. 12C) required a licence, but operators paid no licence fee and used no coupons. They bought the same coloured gasoline that is sold for farm tractors and stationary engines.

All operators of non-commercial water craft also required a licence, for which they paid \$1. They used coupons and bought the same graded gasoline that is sold for automobiles.

All non-commercial water craft were placed in one of two categories. Non-commercial marine category "A" took in nothing but pleasure craft. Non-commercial marine category "B" covered the essential transportation of seasonal residents who have no other means of transportation. Licences issued within both these categories were good only between April 1 and December 31. The order prohibited the use of gasoline for aquatic regattas, races, and similar events.

The non-commercial marine allowances were as follows:

Outboard Motors			
	2 H.P. and under		1¼ units
Over	2 H.P. but not exceeding	5.9 H.P.	2 units
Over	5.9 H.P. but not exceeding	10 H.P.	2½ units
Over	10 H.P.		3 units

Inboard Motors			
	10 H.P. and under		2 units
Over	10 H.P. but not exceeding	20 H.P.	3 units
Over	20 H.P. but not exceeding	30 H.P.	4 units
Over	30 H.P. but not exceeding	40 H.P.	5 units
Over	40 H.P. but not exceeding	50 H.P.	6 units
Over	50 H.P. but not exceeding	60 H.P.	7 units
Over	60 H.P. but not exceeding	70 H.P.	8 units
Over	70 H.P. but not exceeding	80 H.P.	10 units
Over	80 H.P. but not exceeding	90 H.P.	12 units
Over	90 H.P. but not exceeding	100 H.P.	14 units
Over	100 H.P. but not exceeding	125 H.P.	16 units
Over	125 H.P.		18 units

Internal combustion engines for farm and industrial machinery, for which no provincial licence plates were required, were allowed gasoline under the rationing plan, but such gasoline was "marked" with a distinctive colour. In eight of the provinces, all marked gasoline was dyed purple. In Saskatchewan to coincide with existing provincial regulations the gasoline for farm tractors and machinery, other than trucks and private cars, was dyed purple, and the gasoline for other industrial purposes, including the gasoline for commercial marine engines, was dyed green; the marked gasoline used in road

construction or maintenance machinery in that province was dyed purple.

The consumption of marked gasoline from April 1, 1942, to the close of business on October 31, 1942, was 123,490,000 gallons.

Interchange of gasoline between vehicles, or between marine engines and vehicles was prohibited. It was made an offence to use coloured gasoline in a vehicle bearing provincial licence plates or non-commercial water craft. It was also made an offence for a vehicle or boat owner to sell, barter, or give away gasoline or ration coupons, to siphon gasoline to or from a vehicle, or boat. Only authorized service station employees were permitted to detach coupons from ration books.

Motorists, service station operators, distributors, and all others who use or sell gasoline, were made subject to a fine of up to \$5,000, or up to five years' imprisonment, or both, for any contravention of the rationing regulations, or any official order of the Oil Controller. At the end of 1942 there were 36,000 gasoline retail outlets, including pumps operated in connection with other businesses.

Regional offices of the Oil Control were established, and the Regional Managers now have the responsibility of approving or rejecting applications and issuing ration books for preferred categories, and in general of handling all local matters pertaining to the Control. The offices are as follows:

Prince Edward Island, Chappell Building, Charlottetown; New Brunswick, 58 King Street, Saint John; Nova Scotia, 100 Sackville Street, Halifax; Quebec, 11 Dorchester Street, Quebec City; The Chalet, Lafontaine Park, Montreal; Ontario, 792 Bank Street, Ottawa; 253 Spadina Ave., at Grange, Toronto; 655 London Street West, Windsor; Manitoba, Canada Permanent Building, Winnipeg; Saskatchewan, Silverman Building, Regina; Alberta, Williamson Block, Edmonton; British Columbia, 815 West Hastings Street, Vancouver.

On April 30, 1942, O.C. 12A prohibited, except by permit, the use of kerosene in non-commercial marine engines, other than by the Armed Forces of Canada or Allies of Canada or in any part of Canada not included in a province.

On May 12, 1942, O.C. 12B determined that no person shall obtain, or retain in his possession a Category A ration book for a passenger car acquired by him on or after May 12, 1942, if he is or would thereby become the holder of more than one Category A ration book, or if he is the holder of a ration book of a rating higher than Category A, or if any relative living in the same household is the holder of a ration book.

On May 12, 1942, O.C. 12C established rationing regulations for commercial marine engines.

Commercial marine engines mean gasoline operated internal combustion engines for propelling vessels, motor boats, or water craft of any kind regularly used for the following commercial purposes:

Essential transportation to and from a permanent residence;	Logging;
Fishing or guiding as a means of livelihood;	Lumbering;
Ferrying for hire;	Trapping;
Freight-carrying for hire;	Testing of new boats by a boat-builder;
Service of any government, including a municipality (including dredging and salvaging);	Passenger-carrying for hire;
Prospecting;	Towing for hire;
	Such other purposes as the Oil Controller shall by order or direction determine to be commercial purposes.

Effective May 18, the order prohibited any person within the territorial areas of the nine provinces from using gasoline for operation of any commercial marine engine unless he was registered as the owner of such commercial marine engine by the Controller, and a gasoline licence issued to him in respect of such engine.

Licences were issued only in respect of a commercial marine engine in use as such prior to March 1, 1942, or an engine replacing one so used prior to that date.

Only marked coloured gasoline could be used for the operation of commercial marine engines. The order prohibited the use of commercial marine engines for sightseeing.

On May 14, 1942, O.C. 12D amended O.C. 12. It provided that the ration for foreign tourists would be determined by the Controller.

On May 15, 1942, acting in agreement with United States authorities, the Controller reduced all foreign tourist allowances to no more than four units per car per year.

On May 15, 1942, the unit value of the coupon was reduced to two gallons in New Brunswick, Nova Scotia, and Prince Edward Island.

On June 19, 1942, the unit was cut to four gallons in Quebec, Ontario, and British Columbia.

On July 1, 1942, the unit was raised to three gallons in New Brunswick, Nova Scotia, and Prince Edward Island.

On July 2, 1942, the regional offices of the Oil Control took over the handling of all applications and issuing of all ration books. Previously the motor vehicle licencing offices of the various provinces did the actual issuing of the ration books on behalf of the Control.

On August 12, 1942, the Controller ruled that salesmen who drive trucks will be granted a Category "A" ration book on the same basis as salesmen who drive passenger cars.

On August 15, 1942, enforcement officers closed for a week 96 service stations in Montreal, 59 in Toronto, 34 in Winnipeg, and 33 in Vancouver. According to the Controller, the stations were either accepting loose coupons or were taking coupons from ration books not issued for the vehicle to which the gasoline was supplied.

On October 1, 1942, many Canadian motorists had their Category "A" gasoline ration books withdrawn and were allowed a much smaller ration in a new category known as "AA."

The new category included all those who use a car for personal transportation and not in pursuit of their business. They were the motorists who have the least need for a car, the motorists who might have to get along without a car if the oil position of the United Nations continued to deteriorate.

Housewives not employed in war plants, university and high school students, and owners of two or more cars, were among those affected. Also coming within the new category were those who use their cars chiefly for driving to and from their stores, offices, and non-essential factories.

On October 17, 1942, the ration unit value was cut from four to three gallons in Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, thus placing all nine provinces on the same three-gallon basis.

On November 3, 1942, a memorandum informed the industry that the Controller had established a new gasoline rationing classification known as the "Wartime Industrial Transit Category." Coupon books were to be issued to and used by drivers of vehicles carrying workers to and from work in munitions plants under a Wartime Industrial Transit Plan authorized by and operating under the supervision of the Transit Controller. (See Transit Control.)

On November 26, 1942, O.C. 12-D-2 amended O.C. 12. The order provided that for Saskatchewan, marked gasoline sold or consumed only for farm purposes or in the operation of road construction and road maintenance machinery which is operated by any provincial or municipal authority, shall be dyed purple as in other provinces, and gasoline which is required to be marked and is not sold or consumed for such purposes shall be dyed green.

POWER CONTROL

Canada's supply of electrical energy—the "white coal" that turns the wheels of more than 80 per cent of the nation's industry—has proved to be one of the most important reasons why Canada now holds fourth place among the United Nations as a producer of the supplies of war.

Before hostilities began, the country was blessed with surpluses of power, extracted from its mighty rivers by the skill and enterprise of its electrical engineers. Had they not planned wisely, Canada would not now possess the largest aluminum plant in the world, a plant which, expanded many times since war began, now supplies 40 per cent of the Allied requirements. Nor would Canada now be turning out sufficient magnesium for her own needs and for export. Nor would ammunition, tanks, guns, rifles, and other war matériel be streaming in enormous quantities from Canadian factories.

But war industry in Canada is still expanding, and as fast as new power developments are brought into service, new war demands arise to use up the new power and hungrily ask for more.

To meet this situation, the Power Controller has employed two measures, one positive, the other negative. He has watched over and assisted the extension of existing facilities and the building of new plants, and he has

curtailed the civilian use of electricity in the shortage areas.

One new development undertaken since hostilities broke out, a project at Barrett Chute on the Madawaska River in Ontario, is already providing 54,000 horsepower. Another at De Cew Falls, near St. Catharines, Ontario, will yield 65,000 horsepower in 1943, and another is nearing completion on the Musquash River in Ontario's Muskoka district. In British Columbia, the West Kootenay Power Company development at Brilliant will provide about 212,000 horsepower, and in Alberta the Minnewanka Lake Project has added 25,000 horsepower.

International arrangements have been made to utilize more of the flow of the Niagara River, and joint works have been erected to offset ice difficulties. The Ogoki diversion, which will cause some of the streams of the James Bay watershed to change their course and flow into the Great Lakes, is going ahead at full speed.

Also in the far north, control dams have been built to prevent waste of water at flood periods. For the construction of one of these dams, in the latitude of James Bay and far from established lines of transportation, all men, materials, and equipment had to be flown in by airplane. Ordinarily this dam would have taken two years to construct, but under the urgency of war it was built and put into operation in less than a year.

Other developments, all in Quebec Province, included a project of St. Maurice Power Corporation at La Tuque, 178,000 horsepower; three new units of 53,000 horsepower each at Beauharnois Light, Heat and Power Company; Quebec Streams Commission development on the upper Ottawa River, 24,000 horsepower; Pembroke Electric Company development at Black River, 2,200 horsepower; additions totalling 8,000 horsepower effected by replacement of turbine runners at Shawinigan Water and Power Company's La Gabelle and Grand'Mere developments; the addition of a new generator at Shawinigan's Rapide Blanc plant and another at the La Tuque plant, and several important projects related to the production of aluminum. In addition a special electric conduit was built under Montreal to permit the power

produced from St. Lawrence water, which has a steady flow, to be transmitted from midnight to 6 a.m., as well as during other hours in the summer, to the interior areas which are dependent on water storage.

But the story of the most dramatic development of all, one of the greatest power projects in the world, may not be written in detail until the war is over. An all-Canadian project, it is said to rival, at least in some respects, the present Boulder Dam development in the western United States.

Between the two great projects a similarity of methods was employed and similar results obtained, but the Canadian builders had to contend with conditions, such as extreme cold, snow, ice, and heavy rains, which did not prevail in the U.S., and with the even more serious difficulties of wartime shortages of materials and labour. To rush the work through on time, double the number of men had to be employed on the Canadian project; at Boulder Dam the peak was 5,250, whereas in Canada it was 10,140.

The United States was justly proud of having completed the Boulder Dam project in five years, which was two years under the contractual limit. In Canada the project must be completed in two and half years, and already initial power is being used. The installed capacity of Boulder Dam, as of January, 1941, was 975,000 horsepower, whereas the installed capacity of the Canadian plant will be 1,020,000.

Because of these undertakings in Ontario and Quebec, power increases in effect at the end of 1942, plus those coming into effect in the near future, will add an effective electrical capacity of 1,870,000 horsepower to Canada's pre-war capacity. When the war is won, these increases will give Canada a new status in world affairs, but in the meantime, the shortage of power for civilian use is not likely to lessen, except in the summertime.

The first major conservation step initiated by the Controller was the institution of daylight saving throughout the country. Previously by arrangement, all use of electricity to produce steam was banned, and in various

localities control devices were installed on domestic water heating systems so that the power would be shut off during peak hours. As far back as 1941, certain non-war industries were forced to reduce takings when the demand was greatest.

In September, 1942, as the potential shortage became more acute, the Controller took more drastic action. He prohibited the use of electricity for advertising signs, show windows, decorative purposes, certain outdoor lighting, and many other less essential uses; he appealed to the public to reduce domestic consumption by 20 per cent; he embarked on a broader policy of denying non-war industries the power they sought, and in co-operation with the Metals Controller he arranged that no new connections could be made except with his approval.

In October two large power users in Thorold, Ontario, had their supply cut by a total of 24,465 horsepower. Immediately afterwards certain Quebec pulp and paper companies were asked to change their weekly rest day from Sunday to a week day, and other companies were allowed less power. Altogether 100,000 horsepower was withdrawn from the Quebec pulp and paper industry.

These steps all added up to a saving great enough to carry the war industries over the hump demand of the winter of 1942-43.

The duties of the Power Controller are not confined to the control of electric power. He is responsible, as well, for the continued supply of gas to Canadian war plants.

By a series of orders, from February to September, 1942, he caused some 18,000 owners of buildings, including dwellings, in southwestern Ontario to switch over from gas to coal for heating and steam production.

These orders eased the gas shortage in that area somewhat, but not enough. At the instance of the Controller, a still gas plant was installed at the Imperial Oil refinery in Sarnia. The still gas was pumped to the gas wells of the Union Gas Company system and stored against winter demand. A method of mixing propane

gas with natural gas was developed and propane gas plants were erected at Windsor, Brantford, and Hamilton.

In addition, a new coke oven gas plant was constructed in Hamilton. But even with the 36 ovens of this plant in operation, enough gas might not be produced, and the Controller has indicated that one or more 18-oven units might be added.

These undertakings increased the supply of gas for war industries in the highly industrialized area south and west of a line drawn from Hamilton Bay to Galt to Sarnia, but the natural gas fields were petering out, and drastic curtailments of civilian consumption became necessary.

The Power Controller was appointed on August 23, 1940, under P.C. 4129. His headquarters are in Montreal. A chronological summary of his orders is as follows:

Electricity

Two orders-in-council regarding daylight saving were passed. The first, P.C. 4994 of September 20, 1940, made daylight saving applicable all the year round in those municipalities in Ontario and Quebec which had had daylight saving during the summer of 1940. The second, P.C. 547 of January 26, 1942, extended daylight saving to the whole of Canada, effective February 9, 1942.

On September 20, 1942, P.C. 5 prohibited certain non-essential uses of power in shortage areas of Ontario and Quebec where war industries were having difficulty in securing enough electricity. On that same date the Minister appealed to householders in the affected areas to reduce their consumption by 20 per cent.

The order affected all of Ontario south of a line from Parry Sound to Huntsville to Pembroke, and all of Quebec south of the 49th parallel except the following counties: Temiscouata, Rimouski, Matapedia, Matane, Gaspé North, Gaspé South, Bonaventure, Saguenay, Abitibi, Temiskaming, The Island of Anticosti, The Magdalen Islands, and Rivière du Loup, (except the Parish of Notre Dame du Portage and the surrounding area served by the Quebec Power Company).

Within the areas affected, electric signs, both commercial and non-commercial, were prohibited. This involved a ban on all advertising signs, but exempted were direction signs in stores and outdoor nameplates at the office or residence of a physician.

Interior and exterior ornamental, outline, and decorative signs also were prohibited, including outdoor illumination of Christmas trees and other Christmas decorations.

Among the advertising signs not permitted were those on theatres, music halls, and concert halls. The exterior and the interior of such buildings were allowed no more lighting than the minimum necessary for public safety. For the marquee or sidewalk canopy this minimum was defined as no more than one half watt per square foot of floor or sidewalk; for the exterior lighting of an exit or entrance, no more than five watts per foot of width; and for the interior, not more than 40 watts per 100 square feet.

Highway lighting was ruled out, and all street lighting was reduced by at least 20 per cent of ordinary consumption except in areas lit by series of arc lamps placed more than 200 feet apart. No street light could be lit more than half an hour before sunset and more than half an hour after sunrise. Lighting for traffic signals, fire or other public safety requirements, were not affected.

In addition the order prohibited the use of electricity for any of the following purposes:

1. Interior and exterior show window and showcase lighting, other than lights in stock wardrobes.
2. Advertising on news flashographs. (The flashing of news on such an apparatus, or the lighting of a news bulletin board, was allowed.)
3. Electric air heaters or grates in offices and stores.
4. The floodlighting of outdoor ice rinks before 4 p.m. and after 10 p.m.
5. Outdoor lighting of any marquee or sidewalk canopy, whether commercial or non-commercial, in excess of one half watt per square foot of floor or sidewalk.
6. Lighting of exits or entrances to any building in excess of 5 watts per foot of width.
7. Exterior lighting of a gasoline station in excess of 100 watts per active gasoline pump.
8. All outdoor lighting not otherwise mentioned in the order, unless such lighting is essential for public safety.

In addition to the exemption of traffic signal lights, the order did not affect the lighting of war plants, airports, military camps, hospitals, schools, depots for common carriers of freight or passengers, electric plants, oil pipelines, canal locks, transportation repair yards, post offices; and the maintenance and repair of any public utility.

On September 23, 1942, P.C.'s B and C, effective October 1, reduced the electric power from 31,000 to 10,500 horsepower the load supplied to the Ontario Paper Company Limited, and from 9,000 to 5,035 the load supplied to Beaver Wood Fibre Company. Both companies are in Thorold, Ontario.

On October 13, 1942, curtailment of production of nine newsprint mills in Quebec to release 50,000 horsepower for war industries was announced.

On October 15, 1942, the E. B. Eddy Company Limited and the J. R. Booth Limited plants in Ottawa agreed to work on Sundays and take their day off during the week. This step relieved the week-day load and thus made more power available for war purposes.

Gas

On February 23, 1942, P.C. 1 prohibited the installation, transfer, or sale of gas burning equipment for use on the systems of any natural gas company operating in southwestern Ontario, except under permit by the Acting Natural Gas Commissioner for Ontario, acting as agent for the Controller. The order also stated that permits for the transfer by a consumer of his own equipment from one house to another will ordinarily be granted, provided such transfer does not involve the use of additional gas.

On February 23, 1942, P.C. 2 ordered the discontinuance of deliveries of gas for heating to commercial establishments in the territory served by the Union Gas Company of Canada, Limited, where the equipment in such establishment is convertible to the use of coal and the establishment has storage space for two weeks' coal supply. It also ordered the removal of such gas heating equipment by the Union Gas Company. (Amended on June 15, 1942).

The order gives priority to war industries over all other loads, and ordered the temporary discontinuance of gas service to non-war industries when the gas supply of the Union Gas Company to war industries is reduced or in danger of reduction owing to temperature or wind conditions.

Accordingly, on June 15, 1942, three orders were issued, curtailing gas consumption for thousands of users in the area. P.C. 2A rescinded P.C. 2.

It affected the customers of Union Gas Company of Canada Limited of Chatham, the Windsor Gas Company Limited, and the City Gas Company of London. It prohibited the use of gas for heating any building, other than a private dwelling, in which the heating equipment could be converted to coal. It also provided that the gas supply would be turned off from any non-war industry supplied by these companies if the temperature or wind reduced, or threatened to reduce, the supply of gas to war industries.

P.C. 3 also affected customers of the Union Gas Company, the Windsor Gas Company, and the City Gas Company of London. It suspended all equipment rental contracts between these companies and their customers and prohibited the supplying of gas to the contract holders. If within four months after the cessation of hostilities the customer wishes to renew his contract he will be permitted to do so and his written application must be honoured by the company.

P.C. 4 affected the customers of Dominion Natural Gas Company, United Gas and Fuel Company of Hamilton Limited and its subsidiaries, the Port Colborne-Welland Natural Gas and Oil Company Limited, Wentworth Gas Company, Fonthill-Ridgeville Gas Company Limited and the Corporation of the Town of Leamington. It provided that all persons, firms, or corporations drawing gas from these companies, and whose heating equipment could be converted to coal, were denied gas. Their gas equipment was ordered to be removed at once.

On June 29, P.C. 4A amended P.C. 4 by inserting the words "United Fuels Investments Limited and its subsidiaries," immediately after the words "Dominion Natural Gas Company, Limited," in Section 1 of the order.

On September 8, 1942, P.C. 4B provided that in areas served by Union Gas Company of Canada, Windsor Gas Company and the City Gas Company of London, no natural gas may be used in any heating units convertible to coal. It was ordered that all such gas heating burners be disconnected and removed from heating appliances. The gas companies were not required to condition the appliances for the burning of other fuel.



RUBBER CONTROL

One year after Japan's treacherous attack on Pearl Harbour, rubber supplies were so low, and civilian curtailments so severe, that every ounce consumed was going into essential manufacture, and it was no longer possible to distinguish between war and necessary civilian requirements.

By the end of 1942, only 10 per cent of the necessarily meagre consumption was being supplied by continuing imports from Ceylon, South America, Central America, and Africa. The balance of the requirements was being drawn from stockpiles gathered before December, 1941, and closely conserved by the United Nations ever since.

Only by continuing and, if possible, tightening the restrictions, by extending the proportionate use of reclaim from scrap, and by fully utilizing other substitutes, will the Canadian rubber supplies of crude be made to last until synthetic rubber comes into production in this country late in 1943.

Meanwhile no time is being wasted in rushing to completion the western Ontario plant now being constructed by the Government-owned Polymer Corporation Limited, which is expected to produce 34,000 tons of buna-S rubber and 7,000 tons of butyl rubber a year. Nor is any time being wasted in working out the formulae for the use of these synthetic rubbers. Investigations have already shown that the synthetic products will be satisfactory substitutes for crude rubber in almost every article except surgeon's gloves and certain other hospital supplies. But experimentation is advancing so rapidly that by the time the plant begins producing some way may be found for using the synthetics even for those articles.

Three days after Canada declared war on Japan all dealings in new tires and new tubes were prohibited, except by permit and except for the Armed Forces. The following day all processing of crude rubber was "frozen" until January 2, 1942. These temporary orders were replaced later with more permanent regulations which have resulted in a reduction of 85 per cent in the use of crude rubber for civilian purposes.

During the next eleven months the Allied rubber situation grew progressively more serious, and it was felt by the Department of Munitions and Supply that the regulation of rubber in Canada was important enough to justify an individual control over that one commodity. Accordingly on November 2, 1942, under P.C. 9995 and P.C. 9996, the jurisdiction over rubber was removed from the Supplies Control, the new Rubber Control was established, and the official who held the post of Controller of Supplies was named Rubber Controller. At the same time one of the Deputy Controllers of Supplies was made Deputy Rubber Controller.

Immediately following Pearl Harbour, one of the first restrictions imposed was a ban on the manufacture of new passenger car tires and tubes. After this ban had been in effect for more than a year the supply of such tires and tubes had dwindled, used tires and tubes were difficult to obtain, and it was felt that, if absolutely essential cars were to be kept on the road, the ban would

have to be modified, but that reclaim instead of crude rubber would go into any new tires to be made.

At the beginning of 1943 the control situation was this: Usable tires and tubes, and retreading services, were rationed, with 113 Rationing Representatives throughout the nation handling the machinery of equitable distribution to essential users. Only the most essential civilian articles, such as surgeon's gloves, belting, industrial tubing, and waterproof footwear could be made. Rubber reclaimed from scrap was under the same rigid control and was being utilized to as large an extent as possible in the making of essential war supplies. Some reclaim was being released for civilian use, but only for a restricted list of articles.

Proportionate use of rubber is indicated by this table:

	Per cent June, 1942	Per cent December, 1942
1. Tires and tubes for use on army vehicles of all types	74.4	79.3
2. Truck and bus tires, for essential transportation	3.25	3.1
3. Retreading and tire repair materials for Armed Forces and essential vehicles	1.2	1.0
4. Airplane tires and tubes	2.25	.95
5. Mechanical goods, belting, and hose	3.2	7.15
6. Waterproof footwear for Armed Forces and essential civil needs ...	2.9	3.3
7. Wire and cable	2.0	1.6
8. Automotive parts for Armed Forces and essential vehicles	2.0	.7
9. Protective clothing, gas masks	1.8	1.0
10. Tank parts	1.8	
11. Miscellaneous	5.2	1.9
	<hr/> 100.00% <hr/>	<hr/> 100.00% <hr/>

By the end of 1942, much had been done to substitute reclaim in whole or in part for crude in making many essential articles, including military tires and other war supplies. Rubber processors were under very tight control, and the rubber they used, whether for war or civilian manufacture, had to be processed according to mandatory specifications. No rubber was released, even for war

purposes, except by permit, and no part of the civil allotment could be carried over by a manufacturer from one month to the next.

Applications for civil allotments of rubber were considered only for the following list of essentials:

1. Medical, surgical, and laboratory supplies, and druggists' sundries for feeding of infants and the care of the sick.

2. Jar rings and sealing compounds for canning of foods (beverages excepted).

3. Protective clothing, gloves, and footwear for such essential services as firefighting, commercial fishing, mining, lumbering, merchant marine, decontamination and where necessary for workers in the following industries: Acid, electrical, tanning, outdoor workers in shipyards, railway yards, switching and construction works.

4. Mechanical rubber goods, hard rubber, and compounded latex for industrial equipment and for the repair of industrial plants and mines, fire departments, transportation companies, and public services operated in Canada.

5. Component parts, not otherwise specifically mentioned, made wholly or partly of rubber for incorporation in articles of various kinds, if the Controller has first stated in writing that the use of rubber is necessary in their manufacture.

6. Rubber compounds for use in making essential insulated wire and cable.

7. Suction and gasoline hose.

8. Essential plumbers' supplies.

9. Tires 7.00 inches or more in cross-section (industry marking) for other than private passenger cars, and tubes for same.

10. Bicycle tires: (a) Equipment for new bicycles. (b) Replacement—not more than 75 per cent of the units produced in the basic period.

11. Tire repair materials, other than tire repair kits.

12. Camelback for retreading.

13. Automotive parts, if the Controller has first stated in writing that the use of rubber is necessary in their manufacture.

14. Rubber cement for the shoe trade or for such other purposes which the Controller states in writing require the use of rubber. New rubber is not allowed for box toe manufacturing, "sock lining," cold tape, "quarter lining" in the manufacture of leather shoes.

15. Staple black lines of waterproof footwear.

On May 16, 1940, the Government set up a company, Fairmont Company Limited, to purchase, store, and sell to rubber manufacturers crude rubber needed for war purposes. Seven days after the appointment of the Controller of Supplies, rubber was declared a supply under C.S.1-M. Thus designated it came under the jurisdiction of the Supplies Control, and remained the responsibility of that Control until November 2, 1942, when the Rubber Control was established. All the effective regulations concerning rubber that had been issued by the Supplies Control became orders of the Rubber Control.

On September 4, 1941, C.S. 3 established a Rubber Advisory Committee.

On September 12, 1941, P.C. 7191 made Fairmont Company Limited the exclusive trader in crude rubber.

On September 13, 1941, C.S. 4 limited rubber for civilian purposes. Commencing in October, 1941, the total quantity of rubber made available to each processor for civilian purposes was reduced to the following percentages of "average civil requirements" (defined as average monthly consumption of rubber for civilian purposes for the year ended May 31, 1941):

October, 1941—90 per cent; November, 1941—85 per cent; December, 1941—80 per cent.

January, 1942—75 per cent; February, 1942—70 per cent, and thereafter at 70 per cent or such other percentage as the Controller may fix. (Order amended by C.S. 4A on November 4, 1941, but quotas not changed until after Pearl Harbour).

On September 27, 1941, C.S. 6 made a change in the Rubber Advisory Committee membership.

On November 4, 1941, C.S. 4A replaced C.S. 4, which had established quotas for civil rubber production. The new order redefined crude rubber and allowed for discretionary action on the part of the Controller.

On November 4, 1941, P.C. 8545 amended P.C. 7191 by re-defining rubber to exclude Fairmont Company Limited from dealing in synthetic rubbers and guayule, a natural rubber grown in Mexico. (See also May 22, 1942, P.C. 4347).

On November 20, 1941, C.S. 4B established maximum prices which Fairmont Company Limited may demand from purchasers of crude rubber.

On December 11, 1941, four days after Japan entered the war, C.S. 4C prohibited dealing in new rubber tires or tubes of any kind, except by permit. The order exempted war orders and sales of used tires or tubes or retreaded tires. It also exempted tires and tubes supplied with new vehicles. This freezing order was only temporary. It was replaced by a succession of orders, each more rigid than its predecessor.

On December 12, 1941, C.S. 4D prohibited, except for war projects, any processing of rubber between December 13, 1941, and January 2, 1942, except by permit. The Controller announced at the time that in January civilian rubber consumption would be cut to one-half what it was during the year ending May 31, 1941. He issued the first essentiality list, which was later revised.

On December 16, 1941, C.S. 4E provided for the appointment of authorized dealers in rubber and fixed maximum prices for rubber which may be charged by such dealers.

On December 26, 1941, C.S. 3A established a Rubber Substitutes Advisory Committee.

On January 5, 1942, C.S. 4F, the first rationing order, replaced C.S. 4C, the freezing order. It released tires and tubes in accordance with certain limiting conditions. Under these, no person could purchase any tire, casing, or tube, whether new, used, retreaded, recapped, or repaired, unless it was essential to the operation of a vehicle owned by the purchaser, and unless he had no more than one spare capable of being used on such vehicle. The purchase of used tires, casings, and tubes by authorized dealers, dealers in scrap rubber, reclaim manufacturers, and retreaders were exempted from this restriction. No new tire or tube could be supplied for use on any vehicle other than one defined as an "eligible" vehicle.

The order provided that no person, other than a reclaim manufacturer, shall burn or destroy any automobile or bicycle tire, tube, or casing except for the purpose of making its component materials available for the repair and reconditioning of another tire, tube, or casing.

Except for use by doctors, visiting nurses, ambulances, police and fire departments, and trucks, buses, and some essential businesses and public services, no new tires, casings, or tubes, other than those used on bicycles, could be sold. Taxicab owners, department stores, milk, bread, and coal companies, and all others delivering direct to the home, had to get their existing tires retreaded, buy used tires, or do without.

Those persons or organizations permitted under the order to purchase new tires and tubes were required, at the time of making the purchase, to prove their need in a form authorized by the Controller and were required to deliver a used tire or tube removed from a running wheel or from the spare tire rim. They were forbidden from accepting payment for the old tire.

To assist the police in preventing tire thefts, the order made it an offence to sell or purchase any tire from which the serial number had been obliterated.

Purchases of used tires were not restricted, but purchasers were required to show that they needed the tire or tube.

The order listed the following "eligible" vehicles for which new tires and tubes could be purchased when the need was proved:

1. Vehicles operated by physicians, visiting nurses, or veterinarians, and which are used principally for professional services.
2. Ambulances.
3. Vehicles used exclusively for firefighting, police work, garbage disposal, and mail delivery.
4. Vehicles for ten or more passengers operated exclusively for carrying passengers as part of the services rendered to the public by a regular transportation system where no other public transportation facilities are available.
5. Vehicles for ten or more passengers used for carrying students and teacher.
6. Vehicles for ten or more passengers used for transporting employees to and from any industrial or mining establishment except when public transportation facilities are readily available.
7. Vehicles for five or more to carry passengers to and from airports.
8. Vehicles for five or more to carry fare-paying passengers in rural and sparsely settled areas where other facilities are not available.
9. Vehicles for road building and repairs.
10. Trucks for carrying material and equipment for the construction and maintenance of production facilities.
11. Trucks for carrying material and equipment for building defence housing and military and naval establishments.
12. Trucks for repairs to plumbing, heating, and electrical equipment.
13. Trucks for carrying waste and scrap.
14. Trucks used by any common carrier, but not for delivery to private homes.
15. Trucks for ice and fuel, but not for delivery to private homes.
16. Trucks for transportation of raw materials, semi-manufactured goods, and finished products, including farm products and foods, but not for transportation of any of these to private homes. (This eligibility list was revised in C.S. 4J of May 15, 1942.)

Farmers were allowed new tires for trucks to deliver their produce to market and for farm equipment.

For the sake of the order a "new" tire, casing or tube was defined as one which had been used for less than 300 miles. "Eligible" vehicles were allowed one spare if the vehicle ordinarily carried a spare, but no new spare could be supplied with new cars.

Guarantees on tires already sold were all declared by the order to be revised downwards to not more than 90 days, and all new tire guarantees were limited to 90 days.

The order called for exact records from all tire dealers, and provided penalties of up to \$5,000 fine or five years' imprisonment, or both, for any infraction.

On February 4, 1942, C.S. 4G imposed strict control on the purchase and sale of used and retreaded tires and casings, and used tubes.

Under the order, no person could purchase or sell any used or retreaded tire or casing or any used tube unless:

1. The seller had drawn attention to the provisions of this order.
2. After delivery of such tire, casing, or tube the purchaser had no more than sufficient for the running wheels and one spare on each of his vehicles.
3. The purchaser had delivered to the seller a tire, casing, or tube, as the case may be, of the same size as the one purchased, and removed from a rim of his vehicle. No trade-in allowance could be made.

Provision was made for exempting a purchaser from the necessity of delivering to the seller a tire, casing, or tube from the rim of his vehicle in instances where:

(a) The purchaser required it as a spare on a new vehicle purchased without such a spare and the purchaser had no spare for such vehicle.

(b) It was required to replace a stolen tire or tube, and the purchaser would have no more than enough to equip the running wheels and provide one spare.

The sale or purchase of any tire on which the serial number had been destroyed was prohibited, except under permit by the Controller or by a chief of police.

The sale of a tire or casing which there was reason to believe was unsafe, or where there was any carcass break, ply or tread separation, or any broken, cut, or repaired bead, was prohibited.

The order set maximum prices that could be charged for used or retreaded tires or casings and used tubes, and maximum prices that could be charged for repairing or retreading services.

On February 5, 1942, C.S. 3B established a Synthetic Rubber Technical Advisory Committee.

On February 17, 1942, P.C. 1265 authorized Fairmont Company Limited to purchase from any manufacturer or other person any stocks of crude rubber including sole crepe or sole crepe trimming at prices not exceeding the fair cost to such manufacturer or other person. At the same time, it was announced that all scrap rubber in Canada would be taken over by a Government agency to be known as the Scrap Rubber Division.

On March 13, 1942, P.C. 1934 authorized Fairmont Company Limited to purchase rubber at fixed prices.

On March 23, 1942, C.S. 4H prohibited any person from starting into process any rubber reclaim, ground scrap, crumb, springs or any ground uncured scrap containing fabric, for other than defence projects and making munitions, except under permit. Reclaim rubber was thus placed under the same control as crude rubber.

On April 10, 1942, the Controller requested retailers to discontinue advertising, window and store displays, and special-price "sales" of rubber merchandise.

On May 15, 1942, C.S. 4J rescinded C.S. 4F and C.S. 4G, and established tire rationing.

The order limited, for the first time, the purchase of retreaded tires, used tires, used tubes, and retreading services.

It tightened the control over new tires and new tubes.

It set up three classes of eligible tire buyers, on a sliding scale gauged according to the usefulness of the vehicle or its owner, and it ruled out all other motorists as ineligible to buy any usable tire or tube or retreading service. This meant some 800,000 motorists were no longer able to buy even used tires.

It fixed a ceiling on the prices of all usable tires and on retreading.

Apart from legal sales permitted by the order, no person was permitted to buy or sell, borrow or lend, barter or exchange, give away or receive as a gift, mortgage, cut, burn, destroy, or in any way dispose of a usable tire or tube.

The order appointed Tire Rationing Representatives, representing the Controller, to authorize the issuance of ration permits for new tires, new tubes, retreaded tires, and retreading services. Authorized dealers, of which there are some 22,000, were permitted to complete, with the customer, a Purchase Certificate which enabled them to sell to eligible vehicle owners the used tires and used tubes they required.

Under the order a strict priority basis for dealings in usable tires and tubes, and in retreading services, was established. It was provided that if a dealer could not fill each of two orders he must first fill that of the vehicle in a higher class. Before a sale could be made the would-be purchaser had to establish that the following conditions existed:

1. He could not replace the vehicle by another vehicle under his control and not in a higher class. (A doctor, for example, would have to use his family car before he could buy tires for his professional car).
2. He could not transfer to the vehicle a tire (or tube) under his control and not in use on a vehicle in a higher class.
3. He required the tire (or tube) for immediate use.
4. He had turned in to the dealer the tire (or tube) which was being replaced. (In case of theft, or if the vehicle was purchased without a spare, special exemption could be made).

Destruction of rubber was prohibited, except for use as reclaim, or for the repair and reconditioning of a tire or tube.

The order limited tire guarantees to 90 days and to defects in material and workmanship.

Hoarding was prevented by a clause which provided that every person, including dealers, jobbers, wholesalers and manufacturers, was required to report his stocks and all other persons were required to report any tires or tubes over and above those required for the running wheels and one spare of each of their vehicles. The deadline for this report was fixed as May 31, 1942, but was later extended to July 1.

Purchase of bicycle tires and tubes was limited to those required for immediate use. Only two tires and two tubes were allowed for each bicycle.

No new tires were permitted for buses until the operator had first obtained an approval from the Transit Controller. Only essential buses would be given the approval.

Who could buy a tire, what type of tire he could buy, and how he could buy it, were determined as follows:

Class "A"—Upon proof of necessity, and under authority of a Ration Permit, obtainable from a Tire Rationing Representative in any office of the Wartime Prices and Trade Board, new tires, retreaded tires, and retreading services may be bought for vehicles in this class. Used tires and used tubes may also be bought for such vehicles under authority of a Purchase Certificate which can be filled out by any authorized tire dealer. The vehicles in class "A" are:

1. A vehicle driven at least 75 per cent in mileage for the professional use of a physician, surgeon, visiting nurse, or veterinarian.

2. A vehicle operated by any regularly practising clergyman who serves two or more congregations more than three miles apart, or who serves a sparsely settled area.

3. An ambulance, or a hearse or any vehicle used exclusively for funeral purposes.

4. Vehicles used exclusively for firefighting, police services, garbage disposal, mail, and railway express services.

5. A private vehicle operated by an employee of a fire or police service and used 75 per cent in mileage for such service.

6. A private vehicle operated by an employee of a public utility and used 75 per cent or more in mileage for construction or maintenance work.

7. A bus or other conveyance licensed and used exclusively for public transportation, for transportation of students and teachers to and from school, for transportation of employees to and from any industrial or mining establishment or construction project, or for transportation of members of the Armed Services on authorized movements which cannot be performed adequately by other transportation facilities.

8. A truck operated exclusively for the transportation of ice and fuel.

9. A truck or large trailer used exclusively for the transportation of materials and equipment for mechanical, structural, or highway maintenance and repair, or for construction of factories, houses, buildings, roads, highways, dams, and other facilities, or for the maintenance and repair of electrical, plumbing, and heating equipment and of machines, but not for the repair of electrical and other household appliances.

10. A truck for transporting waste and scrap materials.

11. A truck or large trailer for transporting raw materials, semi-manufactured goods, and finished products including farm products and foods, but not for delivery to the home.

12. Farm tractors and harvester combines, other than automobiles and trucks, for the operation of which tires and tubes are essential.

13. Industrial, mining, and construction equipment, for the operation of which tires and tubes are essential. (Used tires and tubes, or retreaded tires must be used if possible).

Class "B"—Upon proof of necessity, and under authority of a Ration Permit, retreaded tires and retreading services may be purchased for vehicles in this class or in Class "A."

Used tires and used tubes may also be bought with a Purchase Certificate filled out in co-operation with any authorized tire dealer. The vehicles in this class are:

1. A vehicle used 75 per cent or more in mileage to transport five or more employees, including the driver, to and from work in a war plant, or to and from work in any essential industry, but only where other transportation facilities are not available. (For certain war industries the Controller may authorize new tires and new tubes for such vehicles). See also Wartime Industrial Transit Plan under Transit Control.

2. A vehicle owned by a person manufacturing munitions, or in some essential industry, and used exclusively for transporting engineers, technicians, and other employees between or within plants where other transportation facilities are not available.

3. A private vehicle used 75 per cent or more in mileage to carry mail.

4. A private vehicle used 75 per cent or more in mileage by a Dominion or provincial government employee for transporting equipment too heavy to carry otherwise, or for health, sanitation, or essential war work.

5. A private vehicle used 75 per cent or more in mileage by a full-time officer, field secretary, or nurse of the Red Cross.

6. A private vehicle used by a full-time employee of the National War Finance Committee.

7. A private vehicle used 75 per cent in mileage for the professional duties of an inspector of the Inspection Board of the United Kingdom and Canada.

8. A vehicle owned by a company operating a flying school under the British Commonwealth Air Training Plan.

9. An official vehicle of the United Kingdom or any other accredited Air Force Mission, or Empire Liaison Mission.

10. A vehicle operated by a Minister of a foreign country, a High Commissioner, including the accredited representative of South Africa, or a director or acting director of the International Labour Office.

11. A vehicle operated exclusively as a taxi, but not a drive-yourself vehicle.

12. A passenger vehicle or trailer used principally for the transportation of produce and supplies to and from his farm by a person whose principal occupation is farming, and who owns no truck.

13. A garage tow truck, or any truck not otherwise provided for.

Class "C"—Upon proof of necessity, and without the need of applying to a Tire Rationing Representative, owners of vehicles in this class or in a higher class, may buy used tires and used tubes direct from any authorized tire dealer. Before the sale is made, a Purchase Certificate must be completed between the buyer and the dealer, and any false statement made in the certificate will be subject to very severe penalties. Vehicles in this class are:

1. A horsedrawn vehicle or farm implement for the operation of which tires are essential.

2. Industrial, mining, and construction equipment for the operation of which tires are essential, but for which used tires are adequate.

3. A foreign car which has been in Canada for more than a week, and for which a tire or tube is essential to its continued operation.

4. A vehicle operated 75 per cent or more in mileage for the professional duties of a Dominion or provincial government employee.

5. A vehicle operated 75 per cent or more in mileage for the duties of members of the diplomatic corps, members of the High Commissioners' offices, consuls general of career, consuls of career, vice-consuls of career, trade commissioners, assistant trade commissioners, members of the international staff of the International Labour Office, a land surveyor, or a farm or food products inspector, an incapacitated individual, a newspaper reporter, a press photographer, a dentist or optometrist who serves more than one community, a bond or life insurance salesman, a salvage or scrap buyer or collector, a judge or other judicial officer, a sheriff or other law enforcement officer, a service man for repair of farm machinery, a service man who repairs office and factory equipment and machinery, a rural school teacher, a Christian Science healer, a drugless healer, or a rural undertaker.

The day after the rationing order went into effect, the Controller announced a ruling, made under the order, that Tire Rationing Representatives would refuse permits for new tires, retreaded tires, new tubes, or retreading services, to the owners of trucks used principally in the transportation of wines, beers, liquors, soft drinks, cosmetics, confectionery, tobaccos, sporting goods, advertising demonstrators and their equipment, jewellery, furs, and other luxury articles and services.

The Scrap Rubber Division, in co-operation with Fairmont Company Limited and the Department of National War Services, undertook a successful scrap rubber collection commencing in May, 1942.

On May 22, 1942, P.C. 4347 amended P.C. 7191 and P.C. 8545 by bringing guayule within the definition of rubber for the purposes of Fairmont Company Limited and for the purposes of the import permit list. It also added rubber products to the import permit list.

The Controller announced on June 3, 1942, that the names of all applicants to whom permits are granted would be made available to the press.

On June 13, 1942, C.S. 4J-1 ruled that tire tread peelings can no longer be applied to other used tires but must be turned over to manufacturers of essential rubber goods. It also instructed dealers to accelerate the process whereby scrap rubber is completely utilized for war purposes. (This order was amended on November 11, 1942).

On July 25, 1942, C.S. 3C added three new members to the Synthetic Rubber Technical Advisory Committee, and provided a substitute for a member who had resigned.

On September 7, 1942, instructions were issued to Tire Rationing Representatives to limit new tire approvals to a quota set for each district. At the outset, it was planned to allow only enough new truck tires for an estimated 60 per cent of existing needs, and only enough new passenger car tires for a very small group of essential vehicles.

The priority list for truck tires covered the following vehicles in this order of preference:

1. Trucks and equipment regularly employed in the construction of war plants or projects, or serving other essential transportation requirements.
2. Trucks for carrying essential raw materials such as timber, ore, and stone.
3. Trucks used for the transportation of essential materials to and from munition plants.
4. Trucks or buses on regular scheduled runs authorized as economic and necessary.
5. Trucks for carrying perishable foodstuffs, provided the transportation is necessary and economic.

Of the popular-sized passenger car tires still on hand there were sufficient to keep in operation for three years only two and one-half per cent of the passenger cars in Canada. The passenger tire priority list covered the following owners in this order of preference:

1. Physicians who must drive their cars on professional duties.
2. Ambulances. (Truck tires, if necessary, will be allowed such vehicles.)
3. Police and firefighters.
4. Mail and railway express operators.

On October 28, 1942, C.S. 3-D re-established the Synthetic Rubber Technical Advisory Committee and named its members.

On November 11, 1942, R 4J-2 amended C.S. 4J and rescinded C.S. 4J-1. The new order narrowed the definition of "authorized dealer" so as to include, as far as possible, only those dealers whose main business is the selling of tires, tubes and retreading services to the public. Under the new definition any dealer who purchased as a consumer (either for himself or for any interests controlled by or controlling him) more than 25 per cent of his total purchases of tires, tubes and retreading services between December 11, 1941, and October 31, 1942, did not thereafter qualify as an "authorized dealer."

For the purposes of the order a scrap dealer was defined as a person who carries on the business of buying and selling scrap rubber, or scrap materials including scrap rubber, and the definition included auto wreckers.

The new order determined that vehicles owned by individuals and used principally in the transportation of engineers and other munition workers between war plants, where other transportation is not available, must thereafter be used for that purpose for at least 75 per cent of their mileage in order to come under a Category "B" tire rating.

Under the new order scrap dealers were permitted to sell scrap rubber resulting directly from manufacturing processes only to a rubber manufacturer or to the Government-owned Fairmont Company Limited, and were permitted to sell other scrap rubber only to another scrap dealer or to Fairmont. It was also emphasized in the order that the dealers must sell their scrap promptly.

A rubber manufacturer, under the order, was allowed to sell rubber scrap resulting directly from manufacturing processes only to another rubber manufacturer, a scrap dealer, or Fairmont. Scrap rubber could be purchased from Fairmont by a reclaim or rubber manufacturer, but only for the purpose of making reclaim, crumb or springs.

Except as provided above, no person was permitted to sell any scrap rubber except to a scrap dealer or an organized salvage corps or Fairmont, except under permit from the Rubber Control or from Fairmont.

The new order also provided that all thefts, or other unauthorized removals of tires or tubes from an authorized dealer, (retailer, distributor, wholesaler, manufacturer or retreader) must immediately be reported by the dealer, in a certified statement to the Rubber Control, setting forth all relevant circumstances.

On December 2, 1942, R-1 rescinded C.S. 3 and C.S. 6, re-established the Rubber Advisory Committee, and named its members.

On December 2, 1942, R-2 rescinded C.S. 3-B and C.S. 3-D, re-established the Synthetic Rubber Technical Advisory Committee, and named its members.

On December 17, 1942, R-3 established a Rubber Conservation and Technical Committee and named its members.

SHIP REPAIRS AND SALVAGE CONTROL

With most of the construction work on the facilities required for the quick handling of ship repairs complete, the Ship Repairs and Salvage Control is now able to meet the increased demands made upon it by all types of naval and merchant vessels of the United Nations. These demands are, in many instances, owing to direct enemy action and sometimes necessitate extensive repairs. In addition ship salvage operations are being conducted on an impressive scale and valuable cargoes are being reshipped to original destinations or channeled into Canadian war industry.

The Controller of Ship Repairs and Salvage, operating with the Ministry of War Transport, ship owners, ship agents, shipyards, drydock operators, machine shops, foundries, ship salvage operators, cargo salvage operators, and ship insurance agencies, expedites the movement of ships and their cargoes, and assures quick action in the event of disasters in Canadian waters. To see that delays are reduced to a minimum, members of the engineering staff of the Control are constantly in attendance at each important port.

To stop the illegal sale of salvaged material to unauthorized persons and to provide compensation in a legal manner to fishermen turning salvage over to the Receiver of Wrecks the following procedure is now being observed:

1. Nothing is to be taken off a wrecked or grounded vessel without authority.
2. Salvaged material will be held by the finder only until he can notify the Receiver of Wrecks for the area.
3. Fishermen turning salvage over to the Receiver of Wrecks will receive a receipt and after the value has been appraised by the Customs Department they will receive an award from the Government.

On November 27, 1940, under P.C. 6797, the Director General of Shipbuilding was also appointed Controller of Ship Construction and Repairs. Because of the urgent need for organizing and regulating ship repairs, early in April, 1941, it was decided that the Controller should give up control over shipbuilding and devote his time exclusively to matters connected with the repair of ships,

including the construction, maintenance, and use of drydocks, and under P.C. 2510 of April 17, 1941, he was given wide powers.

Under P.C. 6797 an advisory committee was appointed comprising representatives of the British Admiralty, Department of National Defence—Naval Services, the Ministry of War Transport of the United Kingdom, the Canadian Shipping Board, and the Department of Transport.

On May 1, 1942, P.C. 3599 amended P.C. 2510, changing his title to Controller of Ship Repairs and Salvage. The new order-in-council extended his powers to include the control and direction of salvaging ships and their cargoes and of all operations relating to such salvage.

STEEL CONTROL

As steel goes, so goes the war. When hostilities began, the Allies were badly off for the types of steel that go into munitions, and badly off in battle. Today, as Allied steel production soars to record heights, the tide of war is beginning to turn.

At the end of 1942, the neck of the bottle had been widened. Canada was turning out more and better steel than at any time in her history. Despite an enormous rise in consumption, she was having to depend on the United States for only two-fifths instead of one-half of her supplies. Production capacity was double that of pre-war days, non-essential use was down almost to zero, and no vital war project or essential industry was being held up for lack of steel.

But mere figures of total production do not tell the story. The most spectacular expansion has been in the field of alloy steels for guns, armour plate, and machine tools, and these are the types which call for the greatest metallurgical skill, the most complex equipment, and the greatest number of man-hours. To begin and expand production of such steel is as much more difficult as to turn out a wedding cake rather than bread.

Before this war, Canada had never manufactured a pound of armour plate, yet today the quality of her product is so high, and the manufacturing process so skilful, that metallurgists from Britain and the United States have come to this country to observe the operations.

The one factory making this plate is now turning out enough to load a mile-long freight train every month. This quantity takes care of all Canadian requirements for this type of steel for tanks, armoured vehicles, gunshields, and for certain Canadian naval purposes.

For 1942 the steel requirements of this country were about 10 billion pounds, of which domestic mills supplied more than six billion. Pig iron production was double what it was in 1939, the output of alloy steels was five times as great, and that of plate, other than armour plate, four times as great.

Yet in spite of this production, which now exceeds the pre-war total of imports plus domestic output, the end of 1942 saw shortages which affected every civilian. Everything made of steel, from hair pins and carpet tacks to automobiles and snow plows, was under strict control. New construction projects had been limited to those essential to the war program, and necessary projects scanned for the purpose of substituting other materials for steel wherever possible. Even the highly essential railroads, biggest civilian users of steel, had been rationed to their minimum needs. And the export of steel in any form had been prohibited, except for wartime needs of the Allies.

To achieve these necessary reductions in civilian consumption, the Steel Controller has adopted two procedures. In the first place he has ruled that no mill may roll any steel except to fill orders which have the prior approval of the Steel Control. In the second place, acting through his fellow Controllers on the Wartime Industries Control Board, and through Administrators of the Wartime Prices and Trade Board, he has assisted in the curtailment of many hundreds of end products for which steel is necessary.

Late in 1942, the powers of the Controller were broadened to meet new circumstances. The sale and use of cast iron pipe and steel pipe were placed on an allocation basis; the United States end-use symbols and steel classifications were adopted to achieve uniformity in statistical data; and the mills were required to assign a competent officer to supervise acceptance of orders so

that no steel might be rolled for other than essential purposes.

In 1942 Canada was using nails at the rate of 100,000 tons per year, or almost enough for the Canadian gun program. Because of heavy demands for war purposes, for wartime housing, and for the construction of grain storage facilities on the Prairies, a shortage had developed, and the Controller reduced the production of less essential wire products to provide more nail steel.

Already under construction at the end of the year were expansion projects at three mills. At one mill a 65-ton electric furnace was to be installed, at another a Bessemer converter, coke oven and blast furnace, and at the third an open hearth furnace. These projects were financed by the Dominion Government. Previous expansion projects were either company-financed or Government financed.

At the instance of the Controller, a campaign for the collection of iron and steel scrap was instituted throughout the western provinces during the summer of 1942. In August an order made it illegal to retain, without permit, more than 500 pounds of iron and steel scrap, including obsolete machinery. In the autumn another scrap campaign was undertaken, this time in Ontario and Quebec. By the time of the freeze-up the scrap stock-piles were sufficient to last out the winter, and in the spring another intensive campaign will be undertaken.

On September 1, 1939, total employment in the primary steel industry in Canada was 13,800. By October 1, 1942, the total had reached 26,800. Begun in 1942, the employment of women in this hitherto "man's game" is likely to increase in 1943.

Historical

On June 24, 1940, under P.C. 2742, a Steel Controller was appointed. The order also established the first steel regulations. At a meeting on July 4, 1940, the Minister outlined the regulations to representatives of the steel industry. No increase in prices was permitted except by approval of the Steel Control, and in October, 1940, prices of steel castings also were frozen.

Steps were taken in 1940 to increase pig-iron capacity and steel-making facilities by obtaining additional melting and rolling equipment for the various mills. Steps were also taken to expand the tool and other special alloy steel capacity. The pig-iron production was soon increased to 350,000 tons per year, and by the end of 1942 was running at a rate of 1,750,000 tons per year.

From the outset of the control, the mills were required to give preference to war orders and were charged with curbing any tendency toward hoarding by their customers.

On December 6, 1940, with the co-operation of the Canadian Institute of Steel Construction and the mills, structural steel shapes were standardized and their number reduced from 267 to 70 sizes. Reinforcing steel was also standardized. These measures increased the mills' output by cutting down the number of roll changes.

In February, 1941, maximum prices for various grades of steel scrap were established in Eastern Canada on basing point system. Maximum prices at western points followed, and also maximum prices throughout Canada for cast iron scrap used by the grey iron and malleable foundries.

In June, 1941, control of the distribution of available foundry and malleable pig-iron was found necessary. This was instituted under a preference system according to purpose of use. It assured an equitable distribution and adequate supply to producers of essential castings.

A U.S. Director of Steel was appointed and stationed at Washington in August, 1941, to advise as to regulatory measures, and to endeavour to obtain steel in the forms and quantities required for vital Canadian needs.

On September 23, 1941, P.C. 39-7474 appointed a Deputy Steel Controller. On October 1, 1942, P.C. 9003 raised him to the rank of Associate Controller, five days after P.C. 8765 had appointed three new Deputy Controllers.

An institution, on September 1, 1941, of mandatory priorities on steel in the United States had an immediate effect on the Canadian imports from that country, and necessitated that all orders be rated for delivery according to their essentiality in the war program. By the end of 1942, virtually all steel and steel products produced in the United States were on direct allocation which also applied to exports to Canada. To prevent U.S. steel from getting into the hands of non-essential users, an additional safeguard was had in the regulation of imports into this country; all such imports were on a permit basis.

On February 19, 1941, Order S.C. 1 established maximum prices for steel scrap, effective February 17, 1941, and ordered steel mills and foundries to import not less than 25 per cent of their total purchased scrap tonnage.

On June 6, 1941, S.C. 2 cancelled all existing orders for pig-iron as of June 9. New orders had to be submitted to the Steel Controller for approval before acceptance by producers of pig-iron. Under this order, approval by the Steel Controller was on a preference basis in accordance with essentiality for the war effort, and categories of essential uses were established for the determination of the degree of essentiality.

On July 9, 1941, S.C. 3 set maximum prices for cast iron scrap purchased by consumers in Ontario and Quebec.

On September 18, 1941, S.C. 4 fixed maximum prices for cast iron scrap delivered to consumers' plants at five basing points in Ontario and Quebec. It made monthly reporting of stocks compulsory on the part of both dealers and consumers in Ontario and Quebec.

On September 23, 1941, S.C. 5 made a licence from the Steel Controller necessary for all dealers in scrap iron and steel selling to ultimate consumers, except only where at the discretion of the Controller an unlicensed person could make an individual sale or sales. The licensee could not deal in scrap at a price higher than the maximum price fixed by the Controller, and he was required to make monthly returns of purchases, sales, and stocks on hand.

On October 30, 1941, S.C. 5A established maximum prices which could be paid for scrap iron and steel in the Provinces of Alberta, Saskatchewan, and Manitoba. A schedule set up classifications of scrap iron and steel and basing points from which prices were prescribed on an f.o.b. basis.

On December 18, 1941, S.C. 7 provided that except under licence by the Controller, no person could supply, acquire, or use new or second hand plain or fabricated steel plates, structural shapes, or bars for the construction, remodeling, or repair, of any building, container-tank, boiler, bridge, tower, conveyor, or other stationary structure.

The use of steel plates, structural shapes, and bars for necessary maintenance and repairs was allowed without permit.

On February 28, 1942, S.C. 8 fixed maximum prices for scrap cast iron in the Maritime Provinces, with a schedule setting up classifications of scrap iron, and basing points from which prices were prescribed on an f.o.b. basis; prescribed price differentials payable for scrap of cupola size and scrap delivered by truck to consumer's plant.

On February 28, 1942, S.C. 9, effective March 17, fixed maximum prices for scrap cast iron in Saskatchewan and Manitoba and for scrap steel in Alberta. Schedules set up classifications of scrap cast iron and scrap steel and basing points from which prices were prescribed on an f.o.b. basis.

Minimum shipping point prices were prescribed for cast iron scrap originating in Saskatchewan and Manitoba and for steel scrap originating in all three Prairie Provinces. These prices prevailed if freight from shipping point to basing point reduced the price to the shipper below those minimum levels. Price differentials were prescribed for scrap of cupola size, and sorting services.

Shipments of scrap cast iron or scrap steel from any point in the Prairie Provinces to any point east of Fort William was prohibited, except under permit.

On February 28, 1942, S.C. 10, effective March 17, fixed maximum prices for scrap cast iron in British Columbia and Alberta, with a schedule setting up classifications of scrap cast iron and basing points from which prices were prescribed on an f.o.b. basis. It prescribed price bonuses payable for scrap of cupola size and scrap delivered by truck to consumer's plant.

On March 5, 1942, effective March 31, the production of grinder balls, including cast and forged iron and steel grinding media, was prohibited, except upon official requisition of the Controller.

On March 12, 1942, a communication requested automobile wreckers to dismantle and scrap all automobiles in their possession, and dispose of scrap iron and steel to scrap dealers within 90 days. If this method of disposal were followed within the prescribed time limit, the automobile wrecker would be permitted to retain a reasonable inventory of parts for resale as such. Otherwise, the Steel Controller stated that he would be obliged to requisition cars in the wreckers' possession for disposal as scrap, and wreckers whose cars were thus requisitioned would not be permitted to select or retain parts.

On March 19, 1942, mills were advised as follows: "All rolling schedules for bars and structural shapes must be submitted by mills for approval by the Controller, and detailed information concerning purchaser, and purpose of use, must be submitted covering each item on the proposed rolling schedules.

All unfilled orders on books of producers placed prior to December 1, 1941, were to be cancelled, with the exception of orders from the following:

Wartime Merchant Shipping, Limited

Government companies

Department of Munitions and Supply

Railroads

Subcontractors for the above organizations.

Cancelled orders, when reinstated were to be treated as new orders and subject to the foregoing provisions.

On March 24, 1942, effective April 1, a directive prohibited mills from producing or shipping plates or sheets except under release from the Controller. This applied to all types and grades, including seconds and wasters.

No rolling or shipments could be made against orders until approved by Controller. Any overages in shipments on scheduled orders had to be reported by mills or galvanizing companies.

On March 24, 1942, S.C. 11 prohibited, except by permit, the importation from the United States for resale, or for processing or fabrication in Canada of any high-speed steel, carbon tool steel or alloy tool steel in any of the following forms: drill rod, music wire, sheets and blanks, hot rolled and cold rolled drawn bars and strip, rock drill steels, forging and billets. Orders placed in the United States prior to March 24 and approved by the Deputy Machine Tools Controller, were exempt from this order.

On March 31, 1942, S.C. 8A defined as "Group A Dealers" those who sold 2,500 net tons in 1940 or 1941.

On March 31, 1942, S.C. 9 made a technical correction to S.C. 8 and was otherwise similar to S.C. 8A.

On March 31, 1942, an agreement with chain link fence manufacturers was announced. It was arranged that after April 30 production would stop and no sales would be made by the fabricators after May 31.

On April 8, 1942, a directive prohibited shipping of structural sections, angles, carbon bars, or alloy bars, except by release from the Controller.

On May 5, 1942, sale and use of stainless steel and stainless iron in the form of bars, sheets, strip, or tubes, was confined, except by permit, to war contracts or orders of the Department of Munitions and Supply.

On May 21, 1942, S.C. 12 established a Technical Advisory Committee on Alloy and Special Steels.

On June 1, 1942, a directive called on producers of standard wire nails, staples, and galvanized and tinned wire to report their stocks on hand each month.

On July 1, 1942, S.C. 13 provided that, without a permit, no person was permitted to supply, acquire, or put into use, any cast iron pipe except for the repair of existing installations in which case the purchaser must file with the vendor a certificate as follows:

- (a) Kind and quantity of cast iron pipe desired.
- (b) That it will be used for the repair of existing cast iron installations.
- (c) Name of particular installation for which such pipe is to be used.

The vendor must keep these certificates for the benefit of the Controller and must not sell any cast iron pipe if he has reason to believe the statements of the purchaser to be false.

The order did not apply to cast iron "soil pipe" or pipe used in the construction of ships.

On July 14, 1942, S.C. 12A extended the scope of the Technical Advisory Committee on Alloy and Special Steels to cover all ferrous metals.

On July 31, S.C. 16 provided that no one, after September 15, may have in his possession scrap metal weighing 500 pounds or more, or for more than 20 days when scrap comes into his possession after that date, unless he has filed with the Used Goods Administrator of the Wartime Prices and Trade Board a certificate showing description, quantity and location, and any valid reason for not selling or disposing of such scrap metal as scrap. Scrap metal is defined as including any article, commodity, material, or thing which contains ferrous metal, whether alone or in conjunction with any non-ferrous metal or other substances, and which is suitable for scrap; and any such article, commodity, material, or thing shall be deemed to be suitable for scrap if it is or forms part of any building, structure, machinery, plant, article, or thing which is disused, obsolete, redundant, or otherwise serving no immediate vital purpose.

On August 7, 1942, S.C. 18 consolidated previous directives. It provided that every purchaser of structural shapes or bars who wishes to place a purchase order with a producer must file a copy of his purchase order with the Controller indicating end use. No producer could include on a mill schedule any purchase order until it had been approved and released for scheduling by the Controller.

On August 31, 1942, S.C. 20 consolidated previous directives. It provided that purchasers of any plates, sheets, and/or forgings, file one copy of the purchase order with the Steel Controller indicating end use. It also provided that purchase orders be not scheduled unless approved by the Controller. Each steel producer was required to report to the Controller all seconds, wasters, rejects, and overages of plates, and no steel producer could sell, supply or otherwise dispose of any of the above except by approval of the Controller.

On September 1, 1942, S.C. 15 prohibited the use of steel pipe for the manufacture, maintenance, or repair of a wide list of specified civilian articles. It also provided that no person, without a permit, could purchase or acquire for use or put into use any steel pipe except for shipbuilding and ship repairs, the manufacture or repair of aircraft, emergency repairs to existing installations of steel pipe, and for certain other war purposes. Steel pipe must not be used, except under permit, for the construction of new underground water or gas mains.

On September 1, 1942, S.C. 19 prohibited the use of stainless steel, except by permit, and required the filing of a statement of inventory by possessors of stainless steel.

On September 10, 1942, S.C. 22 provided that additional deliveries of steel to manufacturers could be made only when stocks on hand were below the quantity required for production.

On September 19, 1942, S.C. 17 established by numerical designations, an official classification of iron and steel products. It formalized and extended previous directives requiring the filing of information prior to obtaining deliveries of steel.

On September 22, 1942, S.C. 21 consolidated the pig iron allocation procedure in operation under the Steel Control since June, 1941, and rationalized it with the system of allocation classification symbols and purchasers' symbols prescribed by P.O.1 of the Priorities Officer.

On October 1, 1942, S.C. 23 restricted the variety of wire nails which could be manufactured.

On November 2, 1942, S.C. 15A amended S.C. 15. For the purpose of S.C. 15A steel pipe was redefined to mean new steel pipe and mill seconds. The provisions of S.C. 15 with respect to the prohibitions on the use of steel pipe, except under permit of the Controller, in the new construction of underground water or gas mains were extended to sprinkler systems and also to any additions to existing underground water or gas mains or sprinkler systems.

On November 24, 1942, S.C. 7A rescinded S.C. 7 of December 18, 1941. From and after November 24, 1942, without a permit from the Controller, no person could use or consume any specified steel product in making, constructing, remodelling, altering or adding to any stationary structure, or in fixing or attaching any stationary structure to the ground or to any building or foundation.

("Stationary structure" for the purposes of this order meant any container-tank, boiler, bridge, tower or conveyer, and any structure fixed or attached to the ground or to any building or place, including, without limiting the generality of the foregoing, any building, roadway, runway, dam, pier, wall, breakwater, cellar, pit, foundation, and any supporting members for machinery, but excluding machinery itself.)

("Specified steel products" for the purposes of this order meant any new, used or secondhand plain or fabricated steel plate, one-eighth of an inch or thicker, and any new, used or secondhand steel shape, steel bar, steel rail and/or steel wire reinforcing mesh, or expanded ferrous metal reinforcing mesh, of 16 gauge or heavier.)

Except for the following persons and purposes, no person could buy or acquire or sell or dispose of any specified steel products without a permit from the Controller:

- (a) Primary producers of steel;
- (b) Owners and operators of steel rolling mills;
- (c) Persons engaged in the business of purchasing specified steel products for resale;
- (d) Industries which use specified steel products in the fabrication of the articles or commodities produced by them.

No person could, without a permit from the Controller, sell, supply, purchase or acquire, any new container-tank, boiler, bridge, tower or conveyer into which any specified steel product had been incorporated.

Every person desiring to purchase specified steel products for the maintenance and repair of any stationary structure was required to certify in writing to this purpose of use; and no person could supply specified steel products for maintenance or repair without such a certificate.

The terms of this order did not apply to used or second-hand specified steel products when legally disposed of as scrap.

SUPPLIES CONTROL

Flexibility is an essential element of the Canadian control program. Policies and procedures suited to the needs of a year ago may no longer meet the changed conditions of today. When and where such situations arise, new policies must be fashioned. One such new policy, of importance to the Canadian war program, is the transfer to the jurisdiction of the Wartime Prices and Trade Board of most of the civilian end products which were previously under the Supplies Control.

This transfer, effected at the turn of the year, 1942-1943, saw refrigerators, electric toasters, stoves, bicycles, metal toys, radios, vacuum cleaners, washing machines, and a host of other metal items no longer under the aegis of the Supplies Control. That control was left with silk, nylon, cork, kapok, hemp, sisal, and certain of the items manufactured from these commodities, plus whatever other basic war materials may be brought within its jurisdiction after transfer from other Government departments or because of fresh war developments.

Only two months earlier the Supplies Control had undergone another radical change. Since shortly after its inception the Control had been responsible for rubber, but by the middle of 1942 the rubber shortage had become so severe and its control so complicated that it was deemed advisable to set up a separate control. Accordingly on November 2, 1942, under P.C. 9995, a new Rubber Control was established, and rubber was no longer under the Supplies Control. On the same date, under P.C. 9996, the man occupying the post of Supplies Controller became Rubber Controller, and under P.C. 9993, the Supplies Control passed into the hands of an Acting Controller, who was also chairman of the Wartime Industries Control Board.

When the Supplies Control was first established on August 19, 1941, under P.C. 6391, it was intended that it should deal with such things as silk, cork, and any other raw materials primarily required for war purposes, but it was believed at that time that it would be equally concerned with a number of manufactured items, direct

control over which would conserve steel and other critical materials.

Early in 1942, however, as shortages became more severe, the Wartime Prices and Trade Board took an increasingly active part in the administration of metal products in their finished form, and as the months went by it became less and less necessary for the Supplies Control to concern itself with end products. Thus in the second half of 1942 few additional manufactured items were added to the Supplies Control lists, and at the beginning of 1943 these and all other Supplies Control metal items were transferred to the Wartime Prices and Trade Board. (Because of the newness of this transfer, summaries of the Supplies Control orders concerning these manufactured items are included in this chapter for the convenience of the reader.)

With the advent of war in the Pacific the Supplies Control became of great importance in the Canadian war program, not only because of its then-exercised jurisdiction over rubber, but also because hemp and other Pacific commodities were suddenly on the shortage lists.

Long before the Pearl Harbour attack on December 7, 1941, Canada prepared for possible shortages of silk and rubber. Stockpiles were gathered and held for Government account, and by the late summer of 1941 civilian curtailments were already in effect.

Insufficient silk was available for milady's stockings and for other civilian demands, but the war supply was eked out and all essential war requirements have been provided. By the middle of 1942, Canada was swinging into the production of nylon, a plastic silk substitute, for parachutes and for certain other war purposes. What remained of the stockpile of real silk was retained for specialized military purposes for which nylon is not suitable.

On December 15, 1941, all dealings in kapok were frozen; this temporary order was replaced later by a regulation restricting its use to purposes essential to the war program.

On Christmas Eve, 1941, dealings in Manila hemp were also frozen, and later its use was confined to the making of rope for the navy and for the ocean-going merchant marine. With Manila hemp thus cut off from widespread civilian use, an unusual demand for sisal suddenly developed, and it too was placed under strict control.

Cork

The principal sources of cork are in the Mediterranean areas. Owing to the shortage of shipping, curtailments of its use in North America have been necessary. As limited supplies of cork are grown in North Africa, the Allied invasion, and the resultant diversion of shipping to that area may help to ease the supply position, but sufficient supplies will not be made available to permit its use for non-essential purposes.

On September 17, 1941, under C.S. 5-M, commercial cork, including cork-wood in a natural or semi-processed state, was declared by the Minister to be a supply.

On November 5, 1941, C.S. 23 established a Cork Advisory Committee.

On November 21, 1941, C.S. 5A-M revoked C.S. 5-M. The new order re-defined cork to include cork products as well as all forms of raw cork.

On November 22, 1941, C.S. 24 provided for the appointment of authorized dealers in cork and cork products, to restrict inventories to no more than three months' normal requirements, and the use of cork for linoleum to no more per month than one-twelfth of that used in 1940. Except under permit, the use of ground cork and cork board for insulating was prohibited except for defence orders and except for the preservation of food and beverages by incorporation into specified types of refrigeration equipment and cold-storage rooms.

On February 18, 1942, C.S. 24A amended C.S. 24 by adding to the list of unrestricted uses of ground cork, or cork insulation board, farm milk cooling tanks which do not require more than 425 board feet of cork board.

Hemp and Sisal

To offset the shortage of hemp which developed when Japan cut off the supply of Manila hemp from the Philippines, plans were being worked out late in 1942 for the production of a large tonnage of North American hemp. Until this production becomes an actuality, Canada will continue to depend on stockpiles built up before Japan entered the war. Manila hemp is the most suitable fibre for use by the navy and the ocean-going merchant marine.

When the shortage of Manila hemp developed, rope makers turned to sisal as a substitute. Although sisal can be obtained from Africa and Mexico, shortage of

shipping space made its transportation difficult, and the new demand soon exceeded the supply. At the close of 1942, the shortage of sisal was one of the more serious problems facing the Control.

Late in December, 1942, the Control prepared an order which will prohibit the manufacture of rope of any kind, except by permit. Manufacture until the war is over will be according to specifications of the Controller, for orders which have his approval.

On December 24, 1941, by C.S. 30-M the Minister declared hemp in all forms, whether processed or not, to be a supply.

On December 24, 1941, C.S. 31- prohibited all dealing in Manila hemp other than for defence orders.

On January 6, 1942, C.S. 33-M declared sisal and sisal fibres of all kinds, whether processed or not, to be supplies.

On January 6, 1942, C.S. 34 prohibited the use of sisal in making skipping ropes, toys or playthings, except by permit.

On January 30, 1942, C.S. 34A rescinded Section 2 of C.S. 31 and Section 2 of C.S. 24 by which supplies of Manila hemp and sisal had been frozen.

Under this order, no person could, except under permit by the Controller:

1. Use any Manila fibre or sisal fibre in or for the making of skipping ropes or any toy or plaything or for tying trees for shipment.
2. Use any Manila fibre or sisal fibre, other than tow, in or for the manufacture of rugs, bedding, and furniture.
3. Make a coil of rope or cable made of or containing Manila fibre or sisal fibre of greater length than standard coil.
4. Begin the processing of any Manila fibre except for the making of:
 - (a) cordage, for use in commercial fishing.
 - (b) cordage, other than stevedoring rope, for commercial marine use on vessels.
 - (c) cordage for use in marine towage and lighterage.
 - (d) drilling cables for oil and gas wells.

In any calendar year, commencing January 1, 1942, except under permit by the Controller, no person shall purchase more than the following percentages of the Manila cordage used by him in 1941:

- (a) 50 per cent of the amount used in commercial fishing.
- (b) 75 per cent of the amount, other than stevedoring rope, used for commercial marine purposes on vessels, or in marine towage and lighterage.
- (c) 100 per cent of drilling cable for oil and gas wells.

Cordage may not be described as "Manila" unless it is made of Manila fibre only.

The manufacture and dealing in binder twine was not restricted except that no Manila fibre shall be used in the making of binder twine. No person shall use binder twine for other than the purpose for which it was made.

On February 12, 1942, C.S. 35 established a Hard Fibre Advisory Committee.

On February 21, 1942, C.S. 34B amended C.S. 34, the Hard Fibre Order, by relieving persons, other than dealers, of the necessity of applying in writing in the instance of purchases of:

1. Less than half a standard coil of sisal rope of not over 1-inch diameter.
2. Less than a standard bale of sisal tying twine.

On March 25, 1942, 34C rescinded 34A and 34B and established new regulations for controlling production and distribution of hard fibres. It froze all stocks of Manila rope in Canada and arrangements were completed with the Melbourne Merchandising Company to purchase these "frozen" stocks so that they might be made available to the navy and Wartime Merchant Shipping Limited. To date, approximately 750,000 pounds of Manila rope have been purchased by Melbourne Merchandising Company. Some of this has already been sold to the navy.

Except under permit, production of Manila cordage in 1942 was limited to 45 per cent of that made in 1941. Purchase and use of Manila cordage was confined to the following purposes, except under permit:

1. Purse lines for use in commercial fishing.
2. Stevedoring rope for use in winches for loading or unloading vessels.
3. Life-boat falls.
4. Tow lines on ocean-going vessels.
5. Drilling cables for mines, oil and gas wells.

No person may use Manila or sisal fibre in making skipping ropes, toys or playthings, or use Manila or sisal fibre, other than tow, in making rugs, bedding, or upholstery.

Production of binder twine was prohibited in 1942, except under permit and the use of Manila fibre in making binder twine or tying twine was prohibited. Binder twine is not to be used for other than for the purpose for which it was made.

Purchases of tying twine by dealers are limited to 60 days' supply and non-dealers to 45 days' supply. Purchases of less than one standard bale by non-dealers are not so limited.

Except under permit, importers of Manila or sisal cordage in 1942 cannot:

1. Sell more than 45 per cent of the Manila cordage sold in 1941.
2. Sell or use more than 70 per cent of the imported tying twine sold or used in 1941.
3. Sell or use more than 100 per cent of the imported binder twine sold or used in 1941.

On May 27, 1942, C.S. 34D prohibited the use of Java sisal in the making of tying twine or binder twine, except by permit.

On July 20, 1942, C.S. 34C-1 was added as a section of C.S. 34C. By the new order inventories of rope made from manila or sisal fibre were limited to normal requirements for 60 days for each size.

On September 8, 1942, C.S. 34C-2 restricted the production of sisal tying-twine in September to 60 per cent of the monthly average production in 1941 and to 50 per cent of the monthly average production in 1941 for October and subsequent months.

On October 17, 1942, C.S. 34C-3 amended C.S. 34C. The new order provided that on and after December 1, 1942, no person could without a permit use any sisal fibre in the making of tying twine. It also provided that no person could, without a permit, make more tying twine containing sisal fibre during the month of October, 1942, than 50 per cent, or during the month of November, 1942, than 35 per cent, of the monthly average amount of such tying twine made by him in 1941; provided that if less than the quotas of such tying twine authorized since April 1, 1942, had been made, the shortages could be added to the quotas for October and November, 1942, and any shortage in the October quota added to the November quota; and it was provided further that all accumulated accruals of such shortages should become void on November 30, 1942.

On January 9, 1943, Supplies 1 provided that no person is permitted to process, and no processor permitted to supply, any Manila hemp, Java hemp, or sisal except by permit, and that no person is permitted to use any such hard fibre in the making of tying twine, lath yarn, shingle yarn, bedding, upholstering, skipping ropes, or any toy or plaything. The order also provided that no person is permitted to use any Manila fibre or Java fibre for binder twine, and that binder twine could not be used for any purpose other than binding or tying agricultural crops.

Under the terms of the order, which superseded all previous orders concerning hard fibres, it became illegal for Canadian buyers to go into the world markets to purchase hard fibres or cordages. Instead, all such purchasing was to be done by Defence Supplies Corporation, a buying agency of the United States Government, and Canadian buyers were required to make their purchases in Canada or from that corporation.

Other than certain cordage bought many months previous to the issuance of the order and to be used for certain specified purposes, no Manila cordage could be used except for purse lines for commercial fishing, stevedoring rope employed in winches for loading and unloading vessels, lifeboat falls, lines exclusively employed as emergency tow lines on ocean-going vessels, and drilling cables for mines, oil wells, and gas wells. The order also prohibited the branding of any cordage as "Manila" unless such cordage contains no fibre other than Manila hemp.

Kapok

Kapok is in short supply. It is a silky fibre obtained chiefly from several species of bombax trees grown largely in Java. Small quantities also have come from other parts of the Netherlands East Indies, from Malaya, the Philippines, Ceylon, Africa, the West Indies, and Ecuador, and an inferior grade from India. It has great buoyancy, is resistant to water, and holds no attraction for insect pests.

To assure sufficient supplies for seamen's life jackets, buoyancy tanks, and life rafts, all supplies were frozen on December 17, 1941.

In peacetime large quantities were used in filling cheap cushions, and some was used for yacht cushions and mattresses to make them unsinkable. Some quantities were used for insulating such articles as ice cream containers.

On December 15, 1941, by C.S. 27-M the Minister declared kapok to be a supply.

On December 15, 1941, Order C.S. 28 froze all dealings in kapok except to fill defence orders.

On March 2, 1942, C.S. 28A set a price ceiling on all raw or semi-processed kapok in Canada.

On May 27, 1942, C.S. 28B froze stocks of used or reclaimed kapok. It prohibited the use of kapok by any manufacturer, except by permit. Its use for making life rafts, buoyancy tanks, life-belts, life jackets, or other lifesaving equipment, except life vests or waistcoats, is prohibited unless the kapok is half reclaim by weight.

On July 24, 1942, C.S. 28A-1 rescinded C.S. 28A which had set ceiling prices on the various grades of kapok.

Nylon

A new plant in Ontario went into operation during 1942, and is now turning out great quantities of nylon. The entire output is allocated for the direct war requirements of Great Britain and Canada. Nylon and nylon products were declared supplies in Order C.S. 41-M on June 12, 1942, and thus came under the jurisdiction of the Supplies Control.

Silk

On May 16, 1940, the Government set up a Crown company, Plateau Company Limited, to purchase, store, and sell silk to war industries. The company co-operates with the Supplies Control in the distribution of silk.

On August 26, 1941, C.S. 1-M declared silk in all its forms to be a supply.

On September 2, 1941, C.S. 2 gave Plateau Company the right to take over any silk owned by any person, or on order. Most of the silk was bought up by the company as a result of this order, and its use for the manufacture of civilian articles, such as stockings, was thus prevented.

On October 21, 1941, C.S. 20 prohibited the manufacture or sale of opened bales of silk, except by permit. The order also fixed prices and terms.

Items Transferred to Wartime Prices and Trade Board

Bicycles

(At the beginning of January, 1943, control over bicycles passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On December 12, 1941, C.S. 25-M declared bicycles to be supplies.

On April 13, 1942, C.S. 38 established a Bicycle Advisory Committee.

On May 8, C.S. 39 prohibited the making of children's bicycles, and eliminated all unnecessary parts and trimmings in new adult bicycles.

After existing stocks of parts which were on hand at May 8, 1942, had been exhausted, manufacturers were allowed to make only three sizes: Two for men, 22-inch and 20-inch; one for women, 20-inch. No model could weigh more than 33 pounds.

Except for the handlebar stem and seat post tube, there would be no nickel plating on the new models. No double-bar was permitted for the men's models, and on all three models the front mudguard was shortened by two inches. Rear stands, luggage carriers, wire baskets, handlebar cross tubes, and other unnecessary parts were eliminated. Necessary repair parts for old models were made available.

On May 27, 1942, Order C.S. 39A prohibited any manufacturer from making bicycles on or after June 8, 1942, without a permit from the Controller.

Each manufacturer was given a quota based on his own percentage of the national output of bicycles in 1941.

Radios

(At the beginning of January, 1943, control over radios passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On October 1, 1941, by C.S. 7-M the Minister declared radios (and refrigerators, electric washing machines, stoves, and vacuum cleaners) to be supplies.

On October 1, 1941, C.S. 8 limited production of radios (and refrigerators, electric washing machines, stoves, and vacuum cleaners) to 75 per cent of the 1940 output.

On October 17, 1941, C.S. 16 established a Radio Advisory Committee.

On October 17, 1941, C.S. 17 limited the production of radios. The order removed radios from the provisions of C.S. 8. Radios were grouped into three classes, on a basis of retail list prices. Commencing in October, 1941, no person was permitted to make more units of each class, without the Controller's approval, than the following percentage of the monthly average units of that class made in 1940:

During October, 1941, 90 per cent; during November, 1941, 80 per cent; during December, 1941, 70 per cent; during January, 1942, 60 per cent; during February, 1942, and each calendar month thereafter, 75 per cent.

In arriving at the quota for each class, adjustment to existing price levels was allowed on the written instructions of the Controller. Instructions were issued that to determine the quota class in which a radio falls, its retail list price was to be taken as the price as of October 1, 1940, plus 20 per cent. Provision for accrual of quota shortages and exemption of repair parts and defence production were the same as in C.S. 14.

On December 15, 1941, Order C.S. 17A reduced to 50 per cent of the average production in 1940 the manufacture of radios in January, 1942.

On January 6, 1942, C.S. 33-M declared radio replacement parts of all kinds to be supplies.

On January 8, 1942, C.S. 17B prohibited radio manufacture, after January 31, except by permit or for the Department of Munitions and Supply or the Department of National Defence. Manufacturers were given permits to assemble radios from stocks of pre-fabricated parts, if at least 75 per cent of such prefabricated parts were on hand on January 8.

On May 27, 1942, C.S. 17C required makers of radio replacement parts to send in complete quarterly reports on output, inventory, and sales.

Refrigerators

(At the beginning of January, 1943, control over refrigerators passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the

orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On October 1, 1941, C.S. 7-M declared refrigerators (and electric washing machines, stoves, radios, and vacuum cleaners) to be supplies.

On October 1, 1941, C.S. 8 limited the production of refrigerators (and electric washing machines, stoves, radios, and vacuum cleaners) to no more than 75 per cent of the monthly average production of such articles in 1940.

On October 17, 1941, C.S. 18 established a Refrigerator Advisory Committee.

On October 20, 1941, C.S. 19 limited the production of refrigerators. The order removed refrigerators from the provision of C.S. 8 and grouped them, by definition, into five classes: (a) Metal-clad electric refrigerators; (b) Metal-clad gas refrigerators; (c) Metal-clad kerosene refrigerators; (d) Metal-clad ice refrigerators; (e) Commercial electric refrigerators. After October 1, 1941, production of the first four classes was based on a quota of 75 per cent of the monthly average of each class of the year 1940. Commercial electric refrigerators were placed on a production quota of 90 per cent of the monthly average in value, including sales tax, of the units of that class made in 1940.

The production of wooden refrigerators, of refrigerators with a h.p. rating of five or more, production for the Department of Munitions and Supply and for the Department of National Defence, and production of spare parts were exempted. Provision was also made for accrual of shortages as in C.S. 14.

On November 4, 1941, C.S. 8A rescinded C.S. 8.

On December 2, 1941, C.S. 18A amended C.S. 18 by adding a member to the Refrigerator Advisory Committee to represent the industrial section of refrigeration industry.

On December 15, 1941, C.S. 19A revoked C.S. 19 and as from January 1, 1942, reduced the production of household refrigerators to 60 per cent of the monthly average number of units of that class made in the year 1940, exclusive of defence orders. The other clauses in C.S. 19 were left unchanged.

On December 15, 1941, Order C.S. 19B in conjunction with C.S. 19A, revoked C.S. 19, as from January 1, 1942. The new order placed a quota of 75 per cent of the monthly average in values, including sales tax, of the 1940 production of commercial refrigerators. The new order, which went into effect on January 1, 1942, excluded orders for the Department of Munitions and Supply and the Department of National Defence. It also prohibited from January 1, 1942, the sale and manufacture or the installation of industrial refrigerators or air-conditioning or comfort cooling systems except for defence orders or by permit. The production of repair parts was not restricted.

On April 1, 1942, by C.S. 7-M-A the Minister declared air conditioning and comfort cooling equipment to be supplies effective as of October 1, 1941.

On April 14, 1942, C.S. 19C prohibited the production for civilian household use of domestic refrigerators, other than ice domestic refrigerators with wooden cabinets, except under permit.

On June 12, 1942, C.S. 19D prohibited sale and installation of all refrigerating equipment (except domestic refrigerators) except under permit. It also prohibited the manufacture of certain metal clad refrigerators for commercial use. This was in addition to the previous prohibition on the manufacture of metal domestic refrigerators.

On June 12, 1942, C.S. 19-D rescinded C.S. 19-B. The new order applied to all refrigerating equipment except domestic refrigerators, and to all air-conditioning equipment.

It prohibited the sale or installation, except under permit, of any such refrigerating or air-conditioning equipment, with the exception of certain specified metal clad types which may be sold or installed without permit only

until present inventories are disposed of, and whose further manufacture is prohibited as from June 16 except under permit. These specified items, whose further manufacture is prohibited except under permit, are:

1. Metal clad reach-in or walk-in refrigerators.
2. Metal clad soda fountains and back bars.
3. Metal clad ice cream cabinets.
4. Metal clad frozen food cabinets.
5. Metal clad carbonated beverage, milk, water, and beer coolers and dispensers.
6. Metal clad ice makers.
7. Metal clad salad cabinets.
8. Metal clad display cases.
9. Metal clad florist boxes.
10. Metal clad farm milk coolers.
11. Metal fronts for refrigerators.

The manufacture and installation of repair parts for existing units was not restricted.

Inventories of raw materials, semi-processed materials and finished parts for production of refrigerating or air-conditioning equipment were restricted to minimum necessary to maintain production.

On September 23, 1942, C.S. 18B rescinded C.S. 18A and announced changes in the personnel of the Refrigerator Advisory Committee.

On December 15, 1942, C.S. 19E restricted the manufacture of domestic ice refrigerators and cabinets without a permit. Effective January 1, 1943, the new order prohibited any manufacturer from making more than two models of domestic ice refrigerators, and or two models of domestic refrigerator cabinets. The order provided that no ice refrigerator may be made with an ice capacity of less than 75 pounds; that the total weight of metal, including joining and fastening hardware, in any domestic ice refrigerator shall not exceed 14 pounds if the ice capacity of the refrigerator is less than 100 pounds, or 17 pounds if the capacity is more than 100 pounds; that no metal be used for the exterior surface, the food compartment, or the food compartment shelving, in any domestic ice refrigerator, or domestic refrigerator cabinet; and that all domestic ice refrigerators or cabinets must contain insulating materials, and the insulating materials must be of a type and thickness approved by the Controller.

Stoves

(At the beginning of January, 1943, control over stoves passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On October 1, 1941, by C.S. 7-M the Minister declared stoves (and refrigerators, electric washing machines, radios, and vacuum cleaners) to be supplies.

On October 1, 1941, C.S. 8 limited the production of stoves (and refrigerators, electric washing machines, radios, and vacuum cleaners) to a 75 per cent quota of 1940 production.

On October 10, 1941, C.S. 9 established a Stove Advisory Committee.

On October 10, 1941, C.S. 10 removed stoves from the provisions of C.S. 8 and curtailed their production. Stoves were grouped by definition, into eleven classifications. It was ordered that no person could make during any calendar month, commencing October 1, 1941, more units of each class than a quota equivalent to 75 per cent of the monthly average number of units of that class made in the year 1940 and it allowed for accrual from month to month but not beyond September 30, 1942. Production of repair parts was not restricted, nor was production for the Department of Munitions and Supply and the Department of National Defence.

On November 4, 1941, C.S. 8A rescinded C.S. 8.

On November 4, 1941, C.S. 10A amended C.S. 10, to grant the Controller discretionary powers.

On December 1, 1941, C.S. 9A amended C.S. 9 by adding a member to the Stove Advisory Committee to represent stove manufacturers in the Maritime Provinces.

On December 13, 1941, C.S. 9B amended C.S. 9 and C.S. 9A by adding a member to the Stove Advisory Committee to represent stove manufacturers in the Province of Quebec.

On April 13, 1942, C.S. 10B prohibited stove manufacture except under permit.

In co-operation with the Stove Advisory Committee a plan was set up whereby stove models will be restricted to a minimum number of designs and must be constructed so that they contain the least amount of iron and steel which is required to supply satisfactory cooking and heating units. It is estimated that this plan will result in a steel saving of about 25 per cent below that required for the production of an equal number of non-simplified units.

On completion of this program, present unit production on quotas based on 1940 will be reconsidered inasmuch as the Controller is of the opinion that the quantities of different types of cooking and heating stoves now being produced are not necessarily those required to supply the country's essential requirements.

On August 7, 1942, C.S. 10C, amending C.S. 10, prohibited the sale after August 10, without a permit, of any electric cooking stove or range over 35 amperes, or combination coal and electric range or electric rangette, except to fill orders already placed by the Departments of Munitions and Supply and National Defence.

The order also prohibited the manufacture after August 31, 1942, without a permit, of any electric cooking stove or range of more than 35 amperes, any combination coal and electric range, any electric rangette, any electric cooking plate, any electric grill, or any electric radiant heater. (Rescinded on August 25, 1942.)

On August 25, 1942, C.S. 10D rescinded C.S. 10C. It provided that on and after August 25, without a permit from the Controller, no person shall make any electric stoves of the following classes:

1. Electric cooking stoves and ranges of more than 35 amperes.
2. Combination coal and electric ranges.
3. Electric rangettes.
4. Electric grills, electric radiant heaters and electric cooking plates, including electric plate attachments for coal or wood stoves.

The order also provided that, without a permit, no stove manufacturer shall sell electric stoves of the following classes, except to fill orders placed by the Department of Munitions and Supply or the Department of National Defence prior to August 10, 1942:

1. Electric cooking stoves and ranges of more than 35 amperes.
2. Combination coal and electric ranges.
3. Electric rangettes.

The order did not apply to the manufacture or sale of repair parts or sale of second-hand stoves.

On August 25, 1942, C.S. 10E supplemented C.S. 10D. It provided that no person other than an authorized dealer shall sell any new electric stove to a consumer, and that the purchase of a new electric stove shall be conditional on the deposit by the consumer with the authorized dealer of three copies of a certificate of essentiality stating, in addition to other relevant information, the following:

1. In the case of purchase of replacement of an existing electric stove, that the old stove is unserviceable and beyond repair.

2. If the stove is not for replacement, that no facilities are available for the installation and operation of a gas, coal or wood stove for cooking, and that, if the building was not suitably wired before August 10, 1942, suitable wiring has been installed, or can be installed at a cost lower than that of connections for a gas, coal, or wood stove.

For the purposes of these stove orders, selling included buying or giving away, or any other means of disposal. Second-hand stoves were not covered in any of the orders.

On November 2, 1942, C.S. 10-E, 10E-1 exempted from the regulations regarding the sale of electric stoves as set forth in C.S. 10E, all sales and purchases of any new electric stove or installation and operation in Alberta, Saskatchewan, and Manitoba, and in the districts of Kenora, Rainy River and Thunder Bay in Ontario. A provision of the new order required that dealers in those areas submit reports of sales by the tenth of each month. The new order also deleted "combination coal or wood electric range" from the definition of "electric stove" in C.S. 10E.

Vacuum Cleaners

(At the beginning of January, 1943, control over vacuum cleaners passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On October 1, 1941, by C.S. 7-M the Minister declared vacuum cleaners and refrigerators, electric washing machines, stoves, and radios) to be supplies.

On October 1, 1941, C.S. 8 limited the production of vacuum cleaners (and refrigerators, electric washing machines, stoves, and radios) to a quota of 75 per cent of the 1940 output.

On October 10, 1941, C.S. 11 curtailed the production of vacuum cleaners and removed vacuum cleaners from the provisions of C.S. 8. The order grouped vacuum cleaners, by definition, into two recognized classes, and ordered that no person shall make during any calendar month, commencing October 1, 1941, more units of each class than a quota equivalent to 75 per cent of the monthly average number of units from each class during 1940, and likewise provided for accrual from month to month but not beyond September 30, 1942. Production of repair parts was not restricted nor was production for the Department of Munitions and Supply and Department of National Defence.

On November 4, 1941, C.S. 8A rescinded C.S. 8.

On November 4, 1941, C.S. 11A amended C.S. 11, the vacuum cleaner curtailment order, to give the Controller discretionary powers.

On August 1, 1942, C.S. 11B prohibited, after August 15, 1942, the manufacture of any type of vacuum cleaner, except by permit. Retail selling was not affected. The Controller announced that permits would be issued only to clear up inventories of pre-fabricated parts, but not after December 31, 1942.

Washing Machines

(At the beginning of January, 1943, control over washing machines passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On October 1, 1941, C.S. 7-M declared electric washing machines (and refrigerators, stoves, radios, and vacuum cleaners) to be supplies.

On October 1, 1941, C.S. 8 limited production of electric washing machines to a 75 per cent quota of 1940 production. (It put stoves, radios, refrigerators, and vacuum cleaners on the same quota.)

On October 14, 1941, by C.S. 12-M, the Minister declared all washing machines as supplies. This declaration supplemented C.S. 7-M which had been confined to electric washing machines.

October 15, 1941, C.S. 13 established a Washing Machine Advisory Committee.

October 15, 1941, C.S. 14 limited the production of washing machines. The order removed washing machines from the provision of C.S. 8. Washing machines, other than for commercial or industrial use, were grouped, by definition, into four classes: (a) Electric washing machines; (b) Gasoline engine washing machines; (c) Hand washing machines with metal tubs; (d) Hand washing machines with wooden tubs.

Production of the first three classes was reduced to 75 per cent of the monthly average units of that class made in 1940 exclusive of the units made for the Department of Munitions and Supply and the Department of National Defence. Of the last class—hand washing machines with wooden tubs—the quota percentage was 100 per cent. Provision was made in all four classes for accrual from month to month but not beyond September 30, 1942, nor beyond the same date in subsequent years. Defence production and the production of repair parts were not restricted.

On October 15, 1941, C.S. 15 placed the production of washing machines for commercial or industrial use, including use in commercial laundries, on a quota, commencing October 1, 1941, equivalent to 75 per cent of the monthly average during 1940. The same provisions and conditions apply as in C.S. 14.

On November 4, 1941, C.S. 8A rescinded C.S. 8.

On December 15, 1941, under order C.S. 14A production of household washing machines was still further reduced. The new order amended C.S. 14 which had provided monthly production quotas of 75 per cent of the average monthly production in 1940. The new order reduced this quantity to 60 per cent effective January 1, 1942.

On December 17, 1941, C.S. 15A revoked C.S. 15 as from January, 1942.

Commencing January 1, 1942, the production of commercial laundry and dry cleaning equipment was placed on a quota equivalent to 75 per cent of the monthly average amount in value, including sales tax, of 1940 production, exclusive of defence orders. The order stated that if less than the authorized quota is made in any month the shortage may accrue and be added to the quota in subsequent months, provided that such accumulations do not extend beyond December 31, in each year.

Owing to the rise in the cost of production, it is estimated that a quota of 75 per cent of the average amount in value of commercial laundry equipment made in 1940 is approximately equivalent to a quota of 60 per cent of the monthly average number of units made in 1940.

The order determined that no person shall make any washing machines except those having wood cylinders and wood outside cases for laundry work, and wood cylinders and steel outside cases for dry cleaning use.

Production of commercial laundry equipment on defence orders was not restricted except by the limitation on the type of materials that may be used. Production of repair parts for existing units of commercial laundry equipment was not restricted.

On April 14, 1942, C.S. 14B prohibited the production, for civilian household use, of electric washing machines, gasoline-engine washing machines, and hand washing machines with metal tubs, except by permit.

On August 18, 1942, C.S. 15B, rescinding C.S. 15A, prohibited the manufacture, sale, or purchase of any new commercial washing machine or commercial laundry or dry-cleaning machinery, except under permit. The provisions of the order do not apply to machines made for the Department of Munitions and Supply and National Defence, or to second-hand machines of the types otherwise under prohibition.

Miscellaneous

(At the beginning of January, 1943, control over the items referred to in this section passed into the hands of the Wartime Prices and Trade Board. Before the transfer, the following orders had been issued by the Supplies Control, and the orders still in effect will remain operative as Wartime Prices and Trade Board orders until and unless they are amended by that Board.)

On October 23, 1941, by C.S. 21-M the Minister declared as supplies the following: Transparent film, sold under the trade name cellophane, sylphrap, diophane, pliofilm, protectoid, kodapak and any similar wrapping for any purpose except for the making of cellulose adhesive tape or for packaging food, candy, drugs, or tobacco, when not in tin or glass containers, except with the Controller's approval. Transparent film for the manufacture of such products as raincoats, umbrellas, and other articles, was exempted.

On October 23, 1941, C.S. 22 provided that transparent film (other than film of $2\frac{1}{4}$ /1,000ths of an inch or more in thickness, or scrap film, or film on hand at that date) may not be used for any purpose except in the making of cellulose adhesive tape, or for packaging candy, food, drugs or tobacco when not in tins or glass containers.

On December 12, 1941, by C.S. 25-M the Minister declared the following to be supplies:

1. Bicycles, tricycles, joycycles, children's wagons and carts made of metal, ice skates, roller skates, and toys which are made principally of metal by weight or value of component materials.
2. All small electrical appliances for household or domestic use.
3. Spring-filled mattresses, bedsprings, upholstering springs, and upholstered furniture in the making of which metal is used.
4. Commercial laundry and dry cleaning machinery which is made principally of metal by weight or value of component materials.
5. Metal wire wastepaper baskets, letter and desk trays.
6. Metal smoking stands and metal trunks.
7. Metal novelties and ornaments.
8. Metal counters, display stands, lockers, partitions, shelving and storage cabinets.
9. Metal radiator covers.
10. Metal fencing and metal signs.
11. Metal coffins and coffins which are made principally of metal by weight or value of component materials.
12. Sewing machines.

13. All furniture known to the furniture trade as "metal furniture."
14. All furniture known to the furniture trade as "metal garden furniture."
15. All other furniture which is made principally of metal by weight or value of component materials.

On December 15, 1941, C.S. 26 prohibited the manufacture, after December 31, 1941, except by permit, and the sale by manufacturers after April 30, 1942, of any of the following:

1. Tricycles, joycycles, children's wagons and carts made of metal, ice skates, roller skates, and toys which are made principally of metal by weight or value of component materials.
2. Electric broilers, household electrical food mixers, and sandwich toasters, roasters and grills, waffle irons.
3. Metal and wire wastepaper baskets and desk trays.
4. Metal smoking stands and metal trunks.
5. Metal trays and metal vases.
6. Metal counters, display stands, partitions and storage cabinets.
7. Metal radiator covers.
8. Metal signs not less than one square foot in size.
9. Metal coffins and coffins which are made principally of metal by weight or value of component materials.
10. Certain specified items of metal furniture, namely, bedroom furniture other than beds, benches, card tables, chairs, coat racks, desks, flower stands or ferneries, foot stools, kitchen cabinets, humidifiers, lamp standards, tables.
11. All furniture known to the furniture trade as "metal garden furniture."
12. Metal fencing for other than agricultural or industrial use.

On December 17, 1941, C.S. 29 limited the use of metals in the manufacture of metal beds and certain other metal products to 70 per cent of the monthly average of consumption in 1940. Production for defence orders and hospitals was specifically exempted and the Controller was given discretionary powers. Accruals from month to month were permitted but not beyond December 31, in any year.

Metal products specified as subject to the 70 per cent metal content restrictions were:

1. Spring filled mattresses.
2. Upholstered furniture, living-room furniture and studio couches, where metal is used for springs or frame.
3. Upholstering springs.
4. Metal couches, beds, and cribs.
5. Metal bedsprings (including wood frame bedsprings).
6. Metal filing cabinets, shelving, safes, lockers, and visible record equipment.

Except under permit, the order also determines that no metal bed shall contain more than four feet of sheet metal panels, or metal panels of more than 22 gauge, and that no bed shall be made with more than six fillers per head or foot.

On January 6, 1942, C.S. ordered that, as from January 31, no person shall make, and as from April 30, no such manufacturer shall sell, any electric grill, percolator, stove for a glass coffee maker or tea kettle, except under permit by the Controller.

Production of electric irons, toasters, and household fans by any person in any year, commencing January 1, was restricted to a quota equivalent to 50 per cent of the total number of each of such appliances made by such person in the year 1940, exclusive of defence orders.

On February 12, 1942, C.S. 22A amended C.S. 22 which had excluded from coverage "existing supplies of transparent film on hand at the effective date of this order." The new order excluded from coverage only "existing supplies of transparent film on hand in Canada at the effective date of this order."

On February 13, 1942, C.S. 36-M declared the following as supplies:

1. Cleaners for kitchen utensils, principally metal by weight or value of component materials.
2. Ornaments and decorations, principally metal by weight or value of component materials.
3. Non-military small arms ammunition.

On February 18, 1942, C.S. 36M-A declared the following as supplies if they are principally metal by weight or value of component materials:

1. Lawn rollers.
2. Paper weights.
3. Shafts and rods for use in manufacturing sporting equipment.

On February 18, 1942, C.S. 26A provided that, except under permit, as from February 28, no person shall make, and as from April 30 no manufacturer shall sell, any of the following items if they are principally metal by weight or value of component materials:

1. Lawn rollers.
2. Paper weights.
3. Shafts and rods for use in manufacturing sporting equipment.
4. Cleaners for kitchen utensils.
5. Ornaments and decorations.

On April 29, 1942, C.S. 25M-A declared the following articles to be supplies: toys, children's sleighs, wagons and carts, phonographs, including electric phonographs, spring powered phonographs, phonograph radio attachments, automatic record changers, gramophones and coin operated phonographs.

On April 29, 1942, C.S. 26B prohibited the manufacture of any toys, children's sleighs, wagons, or carts in which the metal content exceeds 10 per cent by weight, except under permit. It also prohibited the manufacture of phonographs including electric phonographs, spring powered phonographs, phonograph radio attachments, automatic record changers, gramophones and coin operated phonographs.

On April 11, 1942, C.S. 37 prohibited the use of small arms ammunition in any public shooting gallery, including those at any exhibition, fair or other similar place, any commercial shooting device and skeet or trap shooting except when carried on under the jurisdiction of the Department of National Defence. It does not apply to the use of rifle ammunition by a member of a rifle club when participating in club activities.

On May 5, 1942, C.S. 25M deleted metal fencing from the list of commodities designated as supplies.

On May 23, 1942, effective June 1, 1942, C.S. 40 prohibited the making of household sewing machines, household sewing machine parts and household sewing machine cabinets, except by permit.

On July 9, 1942, C.S. 25MC, a Ministerial order, amended C.S. 25M, and redefined metal furniture to take in all furniture of which metal is a component, except metal for casters, stamped pulls for doors and drawers, and small joining and fastening hardware. Such metal furniture as newly defined became a supply, and was thus brought under the jurisdiction of the Controller of Supplies.

On July 7, 1942, C.S. 26D, prohibited the manufacture of metal furniture as defined in C.S. 25MC, except by permit from the Controller. The order prohibited the use of metal for such things as bases for tables or restaurant stools, for chairs, desks, flower stands, outdoor furniture, display stands and benches. It did not extend to the making of parts for spring-filled mattresses, the use of metal for the springs or frame of upholstered furniture, or to couches, beds, cribs, bedsprings, filing cabinets, shelving, safes, lockers, or visible record equipment. These items were covered by C.S. 29 of December 17, 1941.

On July 7, 1942, C.S. 29A made a technical amendment in the wording of C.S. 29.

On August 4, 1942, C.S. 32A amended C.S. 32 and banned the manufacture, except by permit, of electric toasters, electric irons, or electric fans. Permits would only be granted for the assembling of pre-fabricated parts, but manufacture of repair parts would continue.

On August 14, 1942, C.S. 26E amended C.S. 26 by defining metal as any metal other than a precious metal. It also extended the previous order banning the manufacture of metal signs more than one square foot in size to cover metal signs of all sizes including metal illuminated signs, metal street signs, metal name and number plates and identification discs.

On August 25, 1942, C.S. 25M-D amended C.S. 25M by adding "ironers" to the list of electrical appliances declared to be supplies under C.S. 25M. The following articles of which metal is a component, other than metal for small joining and fastening hardware, were also declared to be "supplies": filing cabinets, card index cabinets, shelving, lockers, safes, visible record equipment.

On August 25, 1942, C.S. 32-A1 put electric ironers under the same control as C.S. 32A of August 4, 1942.

On August 25, 1942, C.S. 29B amended C.S. 29. It provided that on and after September 1, 1942, without a permit, no person shall use any metal, except small joining and fastening hardware, in the manufacture of filing cabinets, card index cabinets, shelving, lockers, or safes. Manufacturers of fibre board or wooden filing cabinets could use metal in the form of frames and operating equipment, but were ordered to file their specifications with the Controller for his approval before so doing.

On September 10, 1942, C.S. 29-C rescinded C.S. 29 and C.S. 29-A. It set a quota on the use of spring wire, strip steel and tubing, band steel and angle iron, sheet steel, and other metal parts, in the making of beds and cribs, cots and couches, bunks, mattresses, bed springs, studio couches, chesterfields, divanettes, davenoes, convertio lounges, upholstered springs, and other upholstered furniture, living-room furniture and chairs. Furniture for hospital and for order of the Departments of Munitions and Supply and National Defence could be made outside the quota.

On October 27, 1942, C.S. 29-D prohibited the sale of metal safes except by permit.

On November 25, 1942, C.S. 29-C-1 amended C.S. 29C September 10, 1942, by adding the following with respect to restrictions on the manufacture and repair of bedding and upholstered furniture: "No person shall use in the making and repairing of any of the said articles any metal other than metal for casters and small joining and fastening hardware, unless such person was making or repairing one or more of the said articles during the years 1940 or 1941."

On December 15, 1942, C.S. 26F amended C.S. 26, which prohibited the making of metal signs, to permit the use of terneplate salvaged from old tin cans for the making of war factory personnel tags, badges, or discs. The new order also permitted the making of such tags, badges, or discs from uncoated steel in the form of tin mill black plate or black sheets other than prime material; or from tinplate or terneplate known as "waste waste," "cobble," or scrap. From metals of the same types, tags, badges, and discs could also be made for the identification of poultry or livestock, or for the marking and identification of metal in its production and shipment.

TIMBER CONTROL

From the day Jacques Cartier first set foot on these shores, Canada has been known as one of the richest timber countries in the world; yet at the dawn of 1943 this nation faced a serious timber deficit.

Vast areas still bear forests. The ring of the axe is still heard in the woods. Trainload after trainload of lumber is on the move, and river banks are being piled high with logs ready for the spring drive. But war demands have risen so high that production cannot keep pace. More woodsmen are needed, but more woodsmen are hard to find.

Actually, the total lumber output since the outbreak of war is greater than that of any corresponding period in Canadian history. This total was made possible because of a record-breaking output in 1941, but production has fallen off in recent months so that it is now at a rate approximately that of 1939.

Before the war, 1929 was the year of peak production when 4.741 billion feet of lumber were sawn. In 1939 the total was not quite 3.977 billion feet. In 1940 it rose to 4.629 billion, and in 1941 the all-time record was established with an estimated 5.087 billion.

In 1942 the demand for labour for all types of war industries began rising rapidly and enlistments were at a high rate. As a result loggers were difficult to secure, and production dropped from 10 to 15 per cent. At a rough estimate the year's total was approximately $4\frac{1}{2}$ billion feet.

In British Columbia, the province responsible for 40 per cent of the national output, some 4,000 men were lost from the logging industry to the Armed Services and to other war industries. Even with replacements the figure was only 10,000, instead of the normal payroll of 13,000.

From the farms of Canada east of the Rockies hundreds of men have turned out to supplement depleted lumber crews, but these additional men have not proved sufficient, and at the close of 1942 some 10,000 loggers were needed throughout Canada.

Meanwhile, the wartime demand for lumber continues to rise. Enormous quantities have been used to replace steel in construction work and in the manufacture of hundreds of essential articles. Great quantities have gone into the building of ships, Alaska highway bridges, aircraft, barracks, docks, war factories, airport hangars, and other large-scale undertakings. Millions more have gone into the crating of armoured vehicles, tanks, shells, and other war supplies, and still more millions into countless other uses.

In addition, Canada has had to supply its Allies. In 1941, the record year, the five billion output was used as follows: In Canada, 2.25 billion, (pre-war consumption was 1.5 billion); exported to the United States, 1.25 billion; exported to Britain, 1.25 billion; exported to other United Nations, 250 million. In 1943 the expected output will be 4.1 billion feet, and of this approximately half will be used in Canada, a quarter in the United States, and a quarter in the United Kingdom.

Thus far all agreements with the United Kingdom and the United States for the export of lumber have been kept to the letter, and so Canada has had to go short. At the close of 1942, all large civilian buyers were going begging, and the British Columbia sawmills were running six months behind in filling their war orders because the war demand is largely for types of lumber only obtainable on the Pacific coast.

So far as the civilian is concerned supplies in 1943 will be limited. In some sections of the country small quantities of certain types of lumber may still be available, but various factors will make it difficult to equalize stocks in the hands of wholesalers and retailers, and some other sections may experience something of a lumber famine.

At the close of 1942 the demand for pulpwood had risen to a record peak. Great quantities were being used in explosives and for other war purposes.

Although production as a whole fell off in 1942, in certain categories of lumber it actually increased. The output of plywood and veneers, encouraged by two Crown

companies, Aero Timber Products Limited and Veneer Log Supply Limited, both acting under the direction of the Timber Controller, was greater than at any time previously, and probably will increase in 1943. These special woods, used in aircraft and other war production, are being consumed by English as well as Canadian factories. Canada has undertaken to export to the United Kingdom 70 per cent of its output of Sitka spruce veneer and 35,000 tons of birch logs for aircraft production in that country. In addition, Canada will export to Britain 50 per cent of the fir ply wood which is produced in British Columbia.

Of the 4.32 billion feet output expected in 1943, it is believed that 1.7 billion will be supplied from the British Columbia coastal area, 250 million from the B.C. interior, 500 million from Ontario, 900 million from Quebec, 550 million from the Maritimes, and 420 million from the Prairies.

Historical

The Timber Control was first established on June 24, 1940, under P.C. 2716, and immediately afterward the Controller undertook the organization of the Canadian timber trade into a national entity, and arranged for the stabilization of prices so that centralized buying for Government projects could be effected as economically as possible.

In addition to regulating consumption and directing it to immediate war uses, the Controller was instrumental in evolving new uses for lumber so that steel and other critical materials might be conserved. He has assisted the British Timber Controller in securing supplies in Canada, and has co-operated with the War Production Board in the United States.

In October, 1942, the official who held the post of Controller resigned as such, and by P.C. 9994 of November 3, 1942, he was appointed Associate Controller. In January, 1943, he resigned from the Department. The Controllership, under the same order-in-council, passed into the hands of the official who had been Controller of Supplies.

Orders

On July 19, 1940, a National Lumber Advisory Committee was appointed.

As of December 2, 1940, the importation of hardwood, veneers, or plywood was prohibited, except under permit.

On July 6, 1940, exports of Douglas fir sawlogs were prohibited, except under permit.

On March 19, 1941, wholesale prices of birch lumber in certain air-dried classes were fixed.

On May 26, 1941, the Controller organized twelve regional committees across Canada and appointed representatives of the industry to these committees for the purpose of drawing up ceiling prices for wholesalers, manufacturers, and retailers and for regulating the trade in various regions.

On June 19, 1941, Order T.C. 1 fixed prices for timber, lumber, and millwork at the level obtaining on April 1, 1941. Export trade was exempted.

On August 5, 1941, T.C. 2 established revised maximum ceiling prices for the Pacific Coast region on lumber and Western red cedar shingles.

On August 16, 1941, T.C. 3 established maximum ceiling prices on birch lumber.

On September 8, 1941, T.C. 4 established maximum ceiling prices on spruce from New Brunswick and Nova Scotia.

On September 12, 1941, T.C. 5 established maximum ceiling prices for Eastern white cedar shingles.

On September 12, 1941, T.C. 6 established maximum ceiling prices on hard maple, basswood, and soft elm lumber.

In August and September, 1941, three orders-in-council, P.C. 2448, P.C. 7222, and P.C. 7519, called for export permits on a broad list of lumber items going to all countries.

On September 29, 1941, T.C. 7 fixed maximum carload prices on flooring.

On October 2, 1941, T.C. 8 regulated the distribution of lumber in Canada for Canadian war and domestic requirements.

On December 19, 1941, T.C. 9 fixed maximum prices for spruce lumber shipped from Western Canada into all parts of Canada east of Fort William.

On January 21, 1942, T.C. 10 prohibited the sale in any part of Canada east of Alberta, of pulpwood of spruce, balsam, jack pine, or poplar, at a price higher than the highest lawful price established during the period, July 1 to December 1, 1941.

On February 2, 1942, T.C. 11, regulated prices of hardwood logs or bolts produced in Ontario, Quebec, New Brunswick, and Nova Scotia, and sold for consumption in Canada, at the highest lawful price established in the period September 1 to December 1, 1941.

On June 4 a letter of instruction was issued prohibiting as of June 5 shipments of spruce or lodgepole pine lumber from the Prairie Provinces or northern British Columbia to destinations in Canada east of Port Arthur-Fort William, except to fill war contracts or sub-contracts.

During May several orders establishing maximum prices for various types of timber were issued by the Controller in his capacity as Timber Administrator of the Wartime Prices and Trade Board.

On June 18, 1942, a directive was sent to Canadian exporters of softwood construction lumber ordering them to obtain from their United States customers a preferential declaration before shipping to the United States.

On June 26, 1942, T.C. 12 provided that, without a permit, no person shall fell, transport, convert, process, finish, sell, or supply any Sitka spruce of aircraft quality.

On August 14, 1942, under orders A-337, A-338, and A-141, respectively, the Controller, as Administrator of the Wartime Prices and Trade Board, fixed pulpwood prices in Quebec, Nova Scotia, and Ontario.

On September 1, 1942, T.C. 4A effected changes in fixed prices.

On September 1, 1942, T.C. 5A rescinded a price-fixing order and substituted for it a new order issued by the Controller as Timber Administrator of the Wartime Prices and Trade Board.

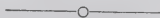
On September 15, 1942, T.C. 13 ordered that Veneer Log Supply Limited shall be the sole purchaser of hardwood veneer logs originating in Nova Scotia, New Brunswick, Quebec, and Ontario, and prohibited anyone from supplying or offering to sell such logs to any other purchaser. The order also prohibited the use of hardwood veneer logs for any purpose other than the manufacture of aircraft veneer.

On September 24, 1942, T.C. 12A placed the production of Sitka spruce, Douglas fir, and Western hemlock under control, and prohibited the production or sale of timber and lumber of aircraft quality except under permit.

On September 30, 1942, T.C. 1A and T.C. 1B effected changes in fixed prices.

On October 6, 1942, T.C. 3A and T.C. 6A rescinded price-fixing orders and substituted for them new orders issued by the Controller as Timber Administrator of the Wartime Prices and Trade Board.

On November 9, 1942, T.C. 14 brought the disposal of Douglas fir logs in the coastal area of the province of British Columbia under control. Logs affected were grades one and two which are sound and thirty inches or over in diameter, ring shake not extending to more than 25 per cent of the circumference of the log, and with no more than a reasonable number of pitch pockets.



TRANSIT CONTROL

With the tempo of industrial and commercial life speeded up to a point hitherto unknown in Canada, with nearly every employable at work, with more money in circulation and more people going places to spend it, and with drastic restrictions on gasoline and tires for private vehicles, the public transit systems have been faced with the almost impossible task of handling roughly twice as much traffic as before the war with few, if any, additional vehicles.

To assist the transit systems to conserve rubber, gasoline, and other critical materials as well as manpower, and to assure the adequate transportation of the Armed Forces and war workers, the Transit Controller has placed all street cars, buses, taxis, jitneys, drive-yourself cars, and ferries, under strict regulation. In addition he

has endeavored to unsnarl parking problems, has staggered hours, and has set in operation a Wartime Industrial Transit Plan under which approved private passenger cars are supplementing mass transportation facilities by carrying plant employees to and from work.

In some 28 centres all across Canada the hours of approximately 325,000 office, factory, and store employees, including 39,000 Government employees in Ottawa, have been staggered to relieve peak pressure on transit facilities, thus making it possible for the same number of street cars and buses to haul more passengers. By March, 1943, a further 100,000 to 150,000 workers will be affected.

During 1942 public transit traffic continued its steady climb in volume and at the end of the year there were no signs of slackening. The heaviest increases on city lines were in Halifax, Quebec, Ottawa, Hamilton, Windsor, Vancouver, and Victoria.

These increases in the fall of 1942, as compared with the same period in 1939, were: Halifax, 200 per cent; Saint John, 80 per cent; Quebec, 90 per cent; Montreal, 65 per cent; Ottawa, 110 per cent; Toronto, 63 per cent; Hamilton, 85 per cent; Winnipeg, 71 per cent; Regina, 50 per cent; Edmonton, 53 per cent; Calgary, 73 per cent; Vancouver, 60 per cent; and Victoria, 85 per cent. Traffic on the inter-urban lines, also on the increase, is indicated by these figures: Gray Coach Lines up 95 per cent, Provincial Transport up 155 per cent; and SMT (Eastern) up 100 per cent. Some of the smaller lines have reported increases of 150 to 190 per cent.

In the late summer of 1942, the Controller recommended to municipalities and operators an eight-point program which has been accepted in whole or in part in most of the larger cities;

1. Staggered hours and a change in school opening hours.
2. Improved regulation of street traffic.
3. Reduction in the number of street car and bus stops.
4. The fullest use of car lines and the minimum use of bus equipment.

5. Extension of facilities to be made to war industries or establishments of the Armed Forces only.
6. Improved efficiency of transit facilities, and two shifts, if possible, in repair shops.
7. Judicious parking of bus equipment between rush hours instead of returning to main storage points.
8. The appointment of local transit committees.

To relieve week-end pressure on the bus and railway lines the Transit Controller and the Transport Controller, in the summer of 1942, initiated an appeal to Dominion Government employees to begin and end their holidays on Mondays, Tuesdays, Wednesdays, and Thursdays. The same appeal was made to the employees of large commercial and industrial houses. It will be renewed in 1943.

Street Cars

By the end of 1942, tramway systems in all large centres, at the instance of the Controller, had eliminated hundreds of intermediate stops. With the co-operation of local wartime transit committees, parking on busy streets in Montreal, Ottawa, Toronto, Winnipeg, and other large centres had been severely curtailed to enable street cars and buses to complete their runs in shorter time and thus carry more passengers per hour. The trend away from street cars to buses had been reversed: old street cars had been resurrected, refitted, cleaned, painted, and put back into operation. Service had been reinstated on some converted electric railway lines and the buses thus released had been turned over to routes serving war industries.

Buses

The control over buses was necessarily more severe than that over street cars. Early in 1942, the Controller ruled out charters for sightseeing trips, week-end excursions, and other luxury bus runs. He curtailed extra-fare urban buses, as well as certain feeder lines, certain special night services in the larger cities, and non-essential parallel routes, both urban and inter-urban. As a result of these moves hundreds of buses were made available and were transferred to war-busy areas where they were needed.

But all these steps did not add up to a sufficient reduction in mileage. Accordingly, in November, 1942, the Controller prohibited the sale of a bus ticket for any trip exceeding 50 miles in one direction. The order applied only on those routes which duplicated railway facilities and affected only from 15 to 20 per cent of the scheduled bus runs. As a result, a wholesale re-scheduling of bus routes was made possible, and it was estimated that to the saving of 15 million bus miles per year effected by the various 1942 restrictions another 15-million mile saving will be added in 1943.

These reductions have the effect of adding to the total number of buses available for essential service. Thus in 1942 it was possible to establish 55 new bus services for the employees of war industries, and 31 for the Armed Forces, as well as to add additional vehicles to services already functioning to war industries.

Because the automotive factories of North America had all been turned over to war production, the output of new buses was reduced almost to zero. In Canada no new chassis were being made except for military vehicles, and thus no new buses could be released except at the expense of the Armed Forces. During 1942, a total of 151 large buses were imported from the United States, and 480 were produced from Canadian assemblies.

Taxis

When gasoline rationing went into effect on April 1, 1942, taxis were classed as commercial vehicles and were allowed gasoline to the extent of their proved normal requirements. Because of progressively reduced rations to the private motorist, and because of the general upswing in business activity, the taxi operators were doing a business of record proportions, and in order to conserve rubber and gasoline it became necessary to restrict their operations. On August 15, the number of taxicabs licensed in Canada was reduced by 30 per cent and all approved cabs were required to register with Transit Control and carry a marker.

On November 15, 1942, the gasoline ration for all taxis was cut to a maximum of 750 gallons per cab for the

period from that date until the end of March, 1943. At the same time the Controller urged taxi operators to pool their facilities in each city by providing a central despatch bureau. Good progress has already been made in many cities in putting pooling into effect. It was estimated in December, 1942, that as a result of the order some 1,100 taxis, or about ten per cent of the 11,000 taxis in Canada, will cease operations.

In large centres the gasoline ration reduction will result in a 30 per cent cut in taxi mileage. In other places, where the mileage ordinarily is lower, the cut will probably vary from 15 to 25 per cent. The impact of the order was most severe on the companies operating two shifts with an annual mileage of 40,000 or more per cab. The operations of some of these companies will be reduced by 50 per cent.

Earlier in the year sightseeing trips were abolished, the use of taxis for messenger service or deliveries was forbidden, and taxis were ordered to confine their operations within a 15-mile radius of their municipality, except in an emergency. Since June, 1942, when the order became effective, about 105 special permits have been issued to take care of local conditions by allowing taxi companies to exceed the 15-mile limit on specially authorized services.

Drive-Yourself Cars

Drive-yourself cars were first placed under regulation in June, 1942, when an order limited their operations to the hours between 6 a.m. and 11 p.m., except in an emergency. This first order also restricted the renting of such cars to a limited few. In December the order was tightened and it was provided that a drive-yourself car could not be rented by anyone except for a business purpose, other than the delivery of goods. It prevented anyone with a car in his possession or under his control from renting a drive-yourself car at any time, unless he is away in a distant city and requires a car for business.

Ferries

As a result of arrangements made by the Controller, a new ferry was purchased to serve North Vancouver war

industries, and an additional ferry was put into service between Halifax and Dartmouth, N.S.

Wartime Industrial Transit Plan

Under the Wartime Industrial Transit Plan, initiated by the Transit Controller and worked out in conjunction with the Oil Controller and the Rubber Controller, fewer passenger cars will be driven to war plants and each car so driven will be fully utilized on every trip. By the end of December, 1942, 70 plants were operating under the plan and surveys had been completed in 840 more which will adopt the plan as soon as they have complied with the requirements.

The plan permits certain approved plants to choose carefully a sufficient number of employee owner-drivers, whose responsibility it is to provide the transportation needs of fellow workers not adequately served by public transit systems. These approved owner-drivers are the only employees of the affected plants entitled to special gasoline and tire privileges. Each month they are granted extra gasoline coupons, and when the necessity arises they will be permitted to purchase usable tires, tubes, or retreading services.

At the outset, the plan provided for the larger industrial and commercial establishments and those which, because of their geographical location, had to depend on private cars for the adequate transportation of their employees. The plan has been made sufficiently flexible so that when necessary it can be expanded quickly to provide a supplementary transit facility when mass transit services become saturated. If necessary, certain concentrations of the Armed Forces will also be included.

Any company which wishes to use the plan must first make a survey of the transportation problems of its employees. When the Transit Control office has approved the establishment, a Plant Transit Officer is appointed. It is this officer's duty to administer the plan in his plant, subject to instructions from the three Control Offices.

The Plant Transit Officer's duties are:

1. To determine which employees shall be designated to come under the plan as riders.

2. To fix operating schedules for the private passenger cars which will be used.

3. To choose which employees' cars shall operate under the plan. This decision will be based on the geographical location, regularity of service, and driving ability of the car owner, and on the mechanical condition and capacity of the car.

4. To make sure that every operating car shall be filled to capacity on every trip.

5. To issue extra gasoline coupons in accordance with the proved additional needs of the car. (Only enough extra gasoline is permitted to take the car on its daily journey to and from the plant).

6. To recommend, whenever necessary, the issuance of tire ration permits for the purchase of usable tires or tubes, or retreading service.

Only employees on fixed shifts or regular hours are included, and no employee within walking distance may drive or be driven under the plan. Travelling inspectors, salesmen, and others whose hours are indefinite, are excluded, but those on regular hours and attached to an establishment, but not on its payroll, may be grouped with employees. Inexpensive insurance was made available by the insurance companies to the establishments, the Plant Transit Officers, and the owner-drivers in respect to legal liability in the event of an accident.

On August 12, 1941, under P.C. 6131, a Transit Controller was appointed. He is responsible for the control of street cars, buses, jitneys, taxis, and ferries. (The control of taxis was in the hands of the Administrator of Services, Wartime Prices and Trade Board, until April 23, 1942, when with the concurrence of the chairman of the Wartime Prices and Trade Board the Transit Controller began exercising the powers he had always had in this respect.)

On August 28, 1941, P.C. 6828 appointed a Deputy Controller.

When the Transit Controller took office his first problem was to consider applications for new equipment from street car and bus companies. At that time, in the fall of 1941, foreign exchange conditions made such purchases difficult, and few permits were granted by the Foreign Exchange Control Board.

The Controller immediately began a study of the transit problems that had arisen from the enormous increase in employment resulting from the war, and of the possibility of staggering hours.

On March 12, 1942, Order No. Transit 1 prohibited the use of buses for sight-seeing tours. Charter trips of an unessential nature were forbidden except for a purpose clearly identified with the war effort.

On April 14, 1942, the first Transit Controller resigned and under P.C. 6828 his Deputy was given the post. The same order-in-council appointed an Associate Transit Controller. Shortly afterwards the Controller moved his offices from Montreal to 255 Bay Street, Toronto, leaving the Associate Controller at 835 Dominion Square Building, Montreal, to handle regional problems in Quebec Province.

Later regional directors were appointed with headquarters at 318 Marine Building, Vancouver; 2225 Eleventh Avenue, Regina; 255 Bay Street, Toronto; 77 Upper Water Street, Halifax, and at Room 2213, No. 2 Temporary Building, Ottawa.

One of the first steps the new Controller took was to negotiate with Washington for the allocation of new equipment to Canadian transit companies. He completed arrangements whereby the War Production Board in the United States would accept his recommendation as sufficient endorsement for the purchase of new buses and street cars.

In line with the policies of his predecessor, the Controller continued the setting up of traffic advisory committees in the principal cities of Canada. These committees comprised representatives of the civic authorities, labor, business, industry, and the local transit utility. Their function is to improve traffic movement and adjust working hours.

Other advisory committees were formed from members of the Motor Coach Association, the Canadian Transit Association, and from taxicab associations in various sections. In highly industrialized areas such as Montreal, Toronto, Hamilton, and the Niagara District, special management committees from the war industries were appointed to survey the effect on transit problems of the decline in private car use and projected plant expansion.

On April 16, 1942, Transit 2 prohibited the operation of any vehicle as a taxi, if it was not so used in 1941.

On May 6, 1942, under Transit 3, vehicles offering public transportation, other than electric and steam railways, were classified as either "chartered vehicles" or "public vehicles." Generally speaking, it defined a "chartered vehicle" as a taxi or drive-yourself car, and a "public vehicle" as a bus or jitney. The order provided that no bus could be operated on a route not approved by the Controller and made it necessary for the operator to justify, as essential to a nation at war, any route which he then operated or intended to operate.

Effective July 15, the order provided that all public vehicles and chartered vehicles, other than horse-drawn vehicles, must be designated as one or the other by official marker, and in the instance of taxicabs and drive-yourself automobiles, the home location of the vehicle must also be shown.

Taxicabs, when in use or available for use, are required to show a sign marked "Taxi." The order also provided that, except by permit, no taxi could be used as a bus. It ruled out the use of taxis for sight-seeing trips of any kind, thus paralleling the similar prohibition (Order No. 1, March 12, 1942) of the use of buses for this purpose. It prohibited taxis from cruising to solicit fares.

It confined the operation of a taxi to a radius of fifteen miles from its home town, and thus banned long distance trips. In exceptional circumstances the Controller would grant a permit modifying this provision. It prohibited a taxi operator from carrying goods of any kind, unless such goods were on the person or were the baggage in the immediate possession of a passenger.

The order confined the hiring of a drive-yourself car to the hours between 6 a.m. and 11 p.m. It prohibited the renting of such a car by a person who owns or controls a car for which a gasoline licence has been issued.

Except with the consent of the Transit Controller, the owner of a drive-yourself car was required to retain at all times the gasoline coupon book issued for the car. He could, however, release the book to a regular customer who hired the car for a professional or business purpose for which the customer, in the past, had hired such a car from the same drive-yourself operator. Every such instance had to be reported within 24 hours to the Transit Controller.

Any of the provisions regarding taxis or drive-yourself cars could be waived by the operator himself in the event of a disaster, a very grave accident, or some other extreme emergency. The provisions could also be waived for the transportation of a Federal Government employee on urgent business of His Majesty. In any such special instance the operator was required to justify his action in a report submitted within 24 hours to the nearest office of the Transit Controller. (On December 10, 1942, this order was revised).

On July 8, 1942, the Controller ordered that no special buses would be permitted to carry troops between Camp Borden and Toronto.

On August 15, 1942, Transit 3A provided that the Controller may require a fee of \$1 for the registration or re-registration of any vehicle required to be registered under Transit 3.

On September 25, 1942, the Minister of Munitions and Supply issued a public appeal to all Canadian to forgo unnecessary travel until the war is over. This appeal was renewed in December, when at the same time the Minister announced that the 50-mile bus limitation order would be suspended

during the Christmas and New Year's holiday season in so far as it affected the armed forces and the merchant marine.

On October 31, 1942, Transit 3B provided that no person shall, without the written general or specific approval of the Transit Controller, sell or supply a ticket for the transportation of a passenger by public vehicle (bus), or convey any passenger in one continuous journey by public vehicle, for a distance greater than 50 miles one way or 100 miles return.

On November 7, 1942, Transit 4 established the basis upon which the Controller proposed to operate the Wartime Industrial Transit Plan. The order provided that the Controller may set up the Plan for any plant or area, and may arrange for the operation under the Plan of motor vehicles approved and registered by the Plant Transit Officer or Local Transit Officer, and may, in co-operation with the other Controllers concerned, grant to, or procure for, the owners of such motor vehicles such assistance or privileges (including gasoline, tires and tubes) as may be deemed necessary or expedient to ensure the effective use of such motor vehicles under the Plan.

The Transit Controller may appoint a suitable person to be Plant Transit Officer, or Local Transit Officer, for any Wartime Industrial Transit Plan and may delegate and assign to him such powers and duties as will assist and guide him in carrying out the directions of the Transit Controller in developing and supervising such plan.

The Plan is designed both to provide additional transit facilities for employees of wartime industrial establishments not adequately served by existing public transportation systems, and to cut down on the use of private cars, by designating certain private cars driven by plant employees as approved vehicles under the Plan, and arranging for the transportation to and from work of other plant employees in these approved vehicles.

On December 10, 1942, Transit 3D tightened Transit 3 as it applied to drive-yourself cars. The new order provided that no person shall hire, rent, take possession of, or use any U-drive or drive-yourself automobile except: (a) for general business purposes, not including the delivery of goods, or (b) for an exceptional emergency. The order also provided that, except in an emergency, no person who owns or has control of an automobile available for use may rent such a car. Under the order the customer must sign forms and must carry one such form so long as the drive-yourself car remains in his control.

TRANSPORT CONTROL

Because of increasingly serious shortages of locomotives, and of all types of passenger and freight cars, the railways of Canada faced 1943 with the prospect of more severe curtailment of civilian traffic which may extend to passenger travel.

Because of these shortages, and in order to save fuel, manpower, and operating equipment, the Transport Controller, before the end of 1942, had prohibited ski trains and all other special trains except those for the movement of the Armed Services, had cancelled convention fares and certain other special fares and, through the Department of Munitions and Supply, had issued an

appeal to all Canadians to forgo travel during the periods when the Armed Forces were on Christmas leave.

In addition, the Controller had issued orders compelling the carrying of greater loads of fruits, vegetables, and other produce in refrigerator cars, and had increased the penalties charged users of such cars for holding the cars longer than is necessary to load or unload. These two measures had the effect of making each car do more work.

In January, 1943, the Controller put into effect a far-reaching order which provides, as far as possible, that every freight car must be loaded to capacity on every trip. He predicted that the order will create hardships, and will make necessary careful planning and co-operation among shippers, buyers, and the railways. The car loadings of all Canadian railroads have at times reached 75,000 per week, a sharp increase over pre-war levels. With the operation of the maximum carloading order, however, it is hoped that carloadings will be reduced and less locomotive miles travelled.

To achieve co-ordination of effort in the solution of transportation problems, the Controller, appointed as such by the Minister of Transport under P.C. 3677 on November 15, 1939, which was amended by P.C. 4251, further amended by P.C. 5285, and extended by P.C. 4487, was made a member of the Wartime Industries Control Board by the Minister of Munitions and Supply on April 23, 1942, under authority of P.C. 6835. His title "Controller" must not be confused with the similar title of members of the Department of Munitions and Supply who are controllers on the Wartime Industries Control Board; it is a title he possessed and acted under six months before the W.I.C.B. came into existence.

On behalf of the Departments of National Defence, Transport, and Munitions and Supply, the Transport Controller arranges charters of both passenger and freight vessels for essential war projects. In co-operation with the British Ministry of War Transport in Canada he makes arrangements for priority inland movement by rail and the allocation of space on ocean vessels for

commodities purchased by or on behalf of the Canadian and British Governments.

On June 24, 1942, T.C. 01.P eliminated special trains to fall fairs and exhibitions, but permitted the continuance of special railway fares for such travel until October 31, 1942. The order also eliminated special fares for travel to celebrations, demonstrations, regattas, political meetings, horse races, plowing matches, rifle association matches, winter fairs, and for hunters, military excursionists, and skiers. The order also modified group fares.

On July 30, 1942, T.C. 02.P effective August 31, 1942, prohibited the railways from granting reduced fares for trips between eastern and western Canada, and between the Prairies and the Pacific coast. It also eliminated special fares for convention groups.

Orders or notices have been issued regulating the use of tank cars.

In co-operation with the railways and railway express companies, regulations are being formulated regarding the curtailment of non-essential deliveries or pick-ups with a view to conserving rubber and gasoline.



CROWN COMPANIES

Aero Timber Products Limited

Now that it has been proved in actual combat that plywood can replace steel in the building of such speedy and deadly aircraft as the Mosquito, and now that Canada is turning out such warplanes, the demand for aircraft quality Sitka spruce has greatly increased.

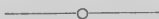
To expand the output of such spruce, Aero Timber Products Limited was incorporated as a Government-owned company on June 19, 1942, with its head office in Vancouver. By the end of the year it had already established its own camps in British Columbia, and was shipping lumber in increasing quantities. In 1943 it is hoped that the output may be doubled.

Sitka spruce is found only on the Pacific Coast. Trees of a size suitable for aircraft production, ranging from six to fourteen feet in diameter, take several hundred years to grow, and are not plentiful. To conserve the supply, the logs are "policed" through the mills, so that no piece of aero lumber may be lost. In addition, the company employs inspectors in the aircraft factories to guard against wastage during processing.

Working in close co-operation with the Timber Controller, Aero Timber Products is sponsoring research work to determine a second choice of aircraft quality lumber. Pacific Coast hemlock has already been selected for certain aircraft purposes, and Douglas fir is being used for propeller stock.

In addition to supplying Canadian needs, the company is exporting to other United Nations.

(See also Veneer Log Supply Limited).



Allied War Supplies Corporation

Allied War Supplies Corporation was incorporated on July 23, 1940, to administer on behalf of the Canadian and British governments explosives, chemical, and

ammunition-filling plants which are owned and financed by the Government.

From comparatively small beginnings, the original program has expanded to involve a capital expenditure of more than \$140 million. The company administers 39 projects, 32 of which are now in operation; the remaining seven, include two scheduled for large-scale production of alkylate for high-octane aviation gasoline.

Of the 18 major projects in operation, three are mammoth shell-filling plants, three are producing explosives, two are big fuse-filling undertakings, and the others are large chemical producers of various kinds. Of the 15 smaller plants on the producing list, 10 are making chemicals, one manufactures fuse powders, and four are turning out or filling smoke bombs, the last for a program which has been expanded sharply during the past year on the basis of heavier requirements from overseas.

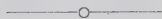
Canada's output of chemicals and explosives in 1940 and 1941 was very large and of outstanding value to the Empire in the most critical years of its history. Production in 1942, however, was more than double that of 1941 and the year was marked by developments highly important to the United Nations. Among these advances were improvements in T.N.T. manufacture which have enabled Allied War Supplies Corporation plants virtually to double the production from existing factories and which have resulted in a substantial saving in capital expenditures; and the replacement of cotton linters by wood pulp in nitrocellulose manufacture, making Canadian production of certain explosives independent of imported cotton linters, and increasing plant capacities.

Shell-filling projects operating under Allied War Supplies Corporation are among the biggest wartime industrial developments in Canada. They have been built from the ground up as self-contained communities employing thousands of workers. The shell-filling program is approaching maximum capacity at a rate of millions of rounds of heavy ammunition per year, over and above a big-scale production of aerial bombs, mines, depth charges, pyrotechnics, and other stores.

Virtually all shells, bombs, and mines made in Canada are filled in Canada and these filling operations consume a large part of the output from the explosives and chemical plants. In addition, however, a substantial proportion of the output is exported to other Empire countries and to the United States.

The Canadian chemical industry, which was created largely as a result of the last war, has been greatly expanded by the huge chemical and explosives program undertaken since 1939 and today is an important factor in world production.

Whereas between 1914 and 1918 Canada was dependent upon imported Chile nitrates for the production of explosives in Canada, Canadian synthetic ammonia production now makes Canada completely independent. Similarly, Canada previously was dependent upon imports of cotton linters for the production of nitrocellulose or guncotton, whereas today Canadian wood pulp successfully replaces the imported cellulose.



Atlas Plant Extension Limited

Canada's entire armament production rests squarely on a foundation of steel. The success of any modern war production program, in fact, is directly dependent on tool steels.

Had it not been for a vastly expanded output of tool steels much of Canada's industrial conversion to war industry would have been impossible. Without provision for great supplies of special alloy steels, Canada's vital guns and small arms program could not have been attempted. At the outset of the war, when it was obvious that expansion of high quality steels output was a necessity, the Government turned to Atlas Steels Limited, a company already organized for the production of all types of special purpose steels.

Atlas Plant Extension Limited was incorporated on October 7, 1940, as a Crown company to construct and administer substantial extensions to the original Atlas

plant on behalf of the Government. The expansion demanded the construction of numerous large units and the installation of much imported machinery and equipment, as well as the training of additional staff for ordnance steel production. These extensions were completed and brought into operation under the stress of keeping the original plant and equipment at capacity output. As quickly as equipment was installed skeleton crews from the original plant were assigned to the training of new help, each unit going into production whether there was a roof over it or not.

A notable feature of the operations at Atlas Plant Extension has been the employment of women as crane drivers, gun barrel machinists, machine operators, chemists, inspectors, and metallurgical observers.

The company produces many types of bored gun forgings for Canada's heavy ordnance program as well as steels for small arms production.



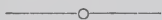
Citadel Merchandising Co. Limited

Modern production methods are so dependent on modern machine tools that Canada's immense war program could not have been planned on its present scale without meeting machine tool shortages. A major agency in solving vital factory equipment problems, Citadel Merchandising Co. Limited was incorporated on May 17, 1940, to purchase and distribute machine tools and to allocate used equipment. The company operates in conjunction with the office of the Machine Tools Controller.

Canadian machine tools production at the outbreak of war was small by comparison with the United States. This country, facing the necessity of great expansion of its industrial capacity, had to depend on United States sources—already swamped with orders—for critically needed machine tools.

Nevertheless, Citadel has been able to arrange for the purchase of quantities of new and used tools for Canadian contractors. It has also encouraged domestic manufacture of machine tools by obtaining plans and drawings for the use of Canadian makers and by designing new machines, particularly single-purpose machines for manufacture in Canada. Since May 1, 1942, with the United States machine tools manufacturing industry working under a priority order of the War Production Board, deliveries to Canadian contractors have been confined to those holding a preference rating secured through the company. Fortunately, Canadian war industry had made good headway in tooling up prior to the entry of the United States into the war, and Citadel had played a big part in speeding up the program.

As a part of the present policy of diversion and use of surplus machine tools equipment, a Machine Tools War Service Committee has been set up to work with Citadel, the Machine Tools Controller, and the Coordinator of Production in order that surplus tools or tools available from Citadel stock may be transferred from one plant to another. In its most recent report, Citadel announced that deliveries of machine tools are catching up with orders.



Cutting Tools and Gauges Limited

Canada's wartime industrial expansion so outpaced cutting tool production that Cutting Tools Limited was incorporated on November 14, 1941, to salvage and recondition worn out cutting tools for use in war plants. Soon after the company was formed it enlarged its operations to include the procurement of gauges, thousands of which are used by Government inspection departments and munitions contractors, and the name of the company was altered accordingly.

The company's production and salvage operations have played a notable part in Canada's war production program by helping to alleviate tool shortages and in emergencies, by making tools. Cutting tools and gauges which might

have been scrapped have been returned to industry with a consequent conservation of material.

The value of monthly production of reclaimed cutting tools now amounts to approximately \$35,000. The procurement of inspection and shop gauges runs to a monthly value of over \$300,000. The Reclaiming Division of the company is staffed by skilled personnel trained at the Eastern Cutter Salvage Corporation plant in Newark, N.J., pioneer firm of the tool salvage industry in the United States.

Fairmont Company Limited

At the close of 1942, Fairmont Company Limited, the Government-owned rubber stockpiling agency, had good supplies of scrap rubber on hand, and a supply of crude rubber which is considered along with the supply in the hands of the United States Rubber Reserve as a joint North American stockpile. This joint stockpile may be sufficient to cover direct war needs until synthetic rubber is available.

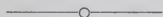
The company, with head office in Toronto, was incorporated on May 16, 1940, to purchase, stockpile, and sell crude natural rubber in accordance with existing and future war needs. During 1942 it also undertook to handle scrap. The company works in close co-operation with the Rubber Controller.

In December, 1942, Fairmont Company Limited began a direct-mail campaign to persuade industries all across Canada to turn in rubber scrap. Late in the summer, it conducted, in co-operation with the Post Office Department and the National Salvage Committee of the Department of National War Services, a postal carrier collection from rural Ontario and Quebec which netted more than 1,500 short tons. In addition, the company has maintained field representatives whose duty it is to keep scrap flowing.

As a result of these activities, and of a campaign launched in the spring by the Scrap Rubber Division of

the Department (now a part of the Fairmont organization), approximately 18,500 short tons of rubber scrap were in the hands of the company and of Canadian reclaimers at the end of the year. For many months the two Canadian reclaim plants have been working at full capacity.

Fairmont Company Limited buys scrap in carload and less-than-carload lots not only from the recognized scrap dealers, but also in some instances from the organizations associated with the National Salvage Committee. It arranges for payment by the Government of all freight charges for transporting the scrap to Montreal and Toronto, where it is converted into reclaim. In addition, it has control over the basic prices fixed for all scrap rubber articles sold for reclaim.



Federal Aircraft Limited

One of the two Crown companies formed to administer the manufacture of Canada's wartime aircraft, Federal Aircraft Limited is charged with co-ordinating the building of the Canadian Anson, a twin-engined advanced trainer.

Under the Joint Air Training Plan, it was originally intended that the United Kingdom would supply all components for the Anson, except the bare wing, and that Canada would manufacture the wooden portion of the wings, the metal fittings also to be supplied from the United Kingdom. During the second quarter of 1940, however, notification was received from Great Britain that there would be a delay of some months in the delivery of the necessary parts and components. As a result it was decided to manufacture the complete plane in Canada.

To co-ordinate the output of Anson parts under the revised plan, to administer the production program, and to segregate this work from the remainder of the aircraft program, Federal Aircraft Limited was incorporated on June 24, 1940.

The British-designed Avro-Anson is regarded as the outstanding twin-engined trainer in the world, and it has been of inestimable value to the Combined Training Establishment. In August, 1942, the aircraft industry under the administration of Federal Aircraft Limited completed its 1,000th Canadian Anson, a version of the British craft modified to meet Canadian conditions, and by December all planes called for under the various contracts held by the company had either been delivered or were in assembly. The company is now about to start production on two new types of the trainer which has already undergone several modifications in design.

The Anson aircraft produced to date is known as the Mark II. The new designs are the Anson V and the Anson VI. They will be in line with demands of the Royal Canadian Air Force for aircraft capable of meeting new training requirements not possible with the earlier models.

The Anson I, which was sent to Canada from British aircraft plants, was powered by the Cheetah engine. When Federal Aircraft Limited began making airframes for the Anson II, the American-made Jacobs engine was used. Later some additional English airframes were received and the Anson IV was powered by Wright-Whirlwind engines. Pratt and Whitney engines are employed in the new Anson V and VI.

The earlier Anson airframe was made of welded steel tubing covered by wood and fabric. Later, the company began to change over from metal to wood in aircraft construction, and many of the components of the new Anson are made of moulded plywood. This development followed an investigation by the National Research Council of the Vidal moulded plywood process in the United States. The report of this investigation prompted the Aircraft Production Branch of the Department to introduce the new process to Canada, and Federal Aircraft Limited is the first organization in Canada to employ the new development.

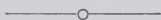
The Vidal process consists of building up sheet structures of the desired thickness with thin veneers of spruce,

poplar, pine, or similar woods, bonded with urea formaldehyde glue. The veneer strips, after treatment with glue, are laid at a 45- or a 90-degree angle, over a die and then placed in an autoclave. They are enveloped in a rubber bag, which keeps moisture from the plywood, and are then processed at a temperature of 200 degrees at a pressure of 70 pounds or greater.

The Anson V is designed as a navigational trainer. The Anson VI will be a bombing and gunnery version. The moulded plywood construction is a pioneering development that is being watched with great interest by British and American aircraft production men. Officials of Federal Aircraft Limited say that the new models will not only save great quantities of critical materials but that the new aircraft will be fast, strong, light, and powerful.

The original Anson program utilized the final assembly service of five aircraft companies. Some of these companies, however, have embarked on new programs and in future it is intended to produce the full complement of Ansons from two contractors, in Winnipeg and Amherst. It is believed that the joint capacity of these two companies will be sufficient to provide a production rate equal to the initial output planned at the start of the Canadian Anson program.

Steps were taken at an early date to provide the large number of spare parts required for normal maintenance not only of the Ansons being produced here but also of the English Ansons. This spares program is well in hand and deliveries for the most part are keeping pace with the main production program.

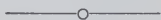


Machinery Service Limited

Under the direction of the Machine Tools Controller, a Crown company, known as Machinery Service Limited was incorporated on December 22, 1941. Its principal function is to overhaul and rebuild used machine tools.

In addition to handling used machine tools which pass through the Montreal warehouse of Citadel Merchandising Co. Limited, Machinery Service Limited reconditions equipment for contractors engaged in the production of war supplies.

The company is unique in that the workmen employed in the plant, all of whom are skilled tool makers, are refugees released from internment camps. The workers are housed in a hostel especially built for their accommodation. They have their own commissariat, and adequate recreation facilities have been provided. Plant and head office of the company are near Montreal, Quebec.



Melbourne Merchandising Limited

Merino tops were in short supply at the close of 1942, but otherwise sufficient wool, woollens, and wool yarns were available in Canada for prospective war requirements.

These commodities to a value of \$1 million are handled every month by Melbourne Merchandising Limited, a Crown company incorporated on September 26, 1940, to purchase in bulk the wool required by the Government for military contracts. The company also acts, when required, as handling agent for the English wool control.

Melbourne Merchandising Limited is responsible to the Department of Munitions and Supply. On its directorate, however, are the Wool Administrator of the Wartime Prices and Trade Board and his two advisers, and these three constitute a majority. In this fashion military needs are co-ordinated with civilian requirements, which are the concern of the Wool Administration and of another Crown company, Canadian Wool Board Limited. This company, in turn, is responsible to the Wartime Prices and Trade Board for the stockpiling of civilian requirements.



National Railways Munitions Limited

The growth and development of National Railways Munitions Limited is a tribute to the skill and efficiency of Canadian workers. Within a period of thirteen months a modern machine shop building, covering 259,000 square feet, was erected in Montreal. Services and machinery were installed, and production was started on a contract for naval guns. While construction was still in progress, tool makers were housed in a temporary wooden structure erected within the shop area preparing jigs, tools, and fixtures needed for the gun contract.

The first order for 12-pounder naval guns having been completed, National Railways Munitions Limited received a second order for a larger naval gun and retooling was immediately started. Within three months the plant was again in production and before the close of 1942 units of the larger guns had passed firing tests, were placed on shipboard, and had gone to sea on active service.

Another order is now in production—the manufacture of army gun carriages. The manufacture and assembly of the approximately 3,000 parts necessary in this artillery mount called for careful planning and engineering.

The plant is virtually self-sustaining, being equipped to manufacture the jigs, tools, and fixtures required for the work which has been undertaken.

National Railways Munitions Limited, incorporated on February 14, 1941, was organized by the Canadian National Railways. The motive power shop of the Canadian National Railway System also furnished 150 skilled men who became the supervisors, foremen, and leading hands of the munitions plant. This nucleus has expanded to a force of approximately 1,000 employees working in day and night shifts. Some of these workers are women who have been trained to operate turret lathes, milling machines, drills, and overhead cranes. These were trained by the skilled railway machinists who also instructed a large number of men to deal with important tasks.

Park Steamship Company Limited

The control and operation of newly built Canadian cargo vessels carrying munitions and supplies to theatres of war is administered by Park Steamship Company, Limited, which was incorporated on April 8, 1942. The company takes over new merchant ships and allocates them to the ocean routes where they can best be utilized to carry Canadian-made supplies to the United Nations. Several of these vessels are now operating between Canada and distant ports. Head office of the company is in Montreal.

Plateau Company Limited

Originally established to purchase, store, and sell raw silk in accordance with existing and future war needs, Plateau Company Limited, a Government-owned company, is now also handling substantial quantities of raw cotton and a limited amount of kapok. Plateau Company Limited has recently been designated by the Controller of Supplies to acquire and distribute the nylon necessary for Canadian war requirements.

Following the order-in-council, which on August 9, 1941, froze all raw silk not then in process, the Minister of Munitions and Supply named Plateau Company Limited, as his authorized representative for all purposes of the order-in-council.

The company was incorporated on May 16, 1940. In distributing the various commodities under its control, the company acts in co-operation with the Controller of Supplies. Operations of the company are conducted along the usual commercial lines.

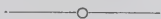
Polymer Corporation Limited

Construction of the various units comprising the synthetic rubber plant being built in southwestern Ontario is well under way. Actual production is expected to begin at some date prior to the end of 1943.

The new development, which will place Canada on a self-supporting basis as far as rubber for essential needs is concerned, is being undertaken by Polymer Corporation Limited, a Government-owned company incorporated on February 13, 1942, to manufacture or provide for the manufacture of synthetic rubber by a process known as polymerization.

The products of the company, to be earmarked for war purposes, are known as buna-S rubber and butyl rubber. Buna-S is made from butadiene, approximately 80 per cent, and styrene, approximately 20 per cent. The anticipated annual capacity will be 10,000 short tons of styrene, and 30,000 short tons of butadiene. The main co-polymer plant in which the butadiene and styrene will be synthesized into buna-S rubber will have an annual capacity of approximately 34,000 long tons.

Butyl rubber is produced from one of the gases extracted as one of the steps in the manufacture of butadiene and the plant for the production of butyl rubber will have a minimum annual capacity of about 7,000 short tons.



Research Enterprises Limited

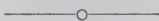
Research Enterprises Limited was incorporated on July 20, 1940, to provide facilities for the manufacture of war equipment of a secret nature developed by the National Research Council; and for the production of optical glass, fire control instruments, both optical and electrical, and electrical devices required by the navy, army, and air force.

Working in a highly technical field, employees of this company enjoyed no background of Canadian experience when they started manufacturing these intricate precision instruments. By July, 1941, however, they were proving equal to their responsibilities. By the end of 1941, the production goal of 5,000 pounds of optical glass per month had been more than doubled. Then, during the first eight months of 1942 monthly production rose 400 per cent to the point where it was five times as great as that called for under initial schedules.

The original group of buildings planned for Research Enterprises Limited occupied $3\frac{1}{2}$ acres. The total acreage of the company's property at Leaside is now 55 acres, the total floor area of the various buildings being approximately 750,000 square feet.

Of the 6,425 workers now employed by this huge Government-owned plant, 2,227 are women. About 37 per cent of the women employed are married.

The company now has orders for radio and optical equipment totalling more than \$100 million. Among the optical instruments already produced in substantial quantities are: Prismatic gunsights, binoculars, clinometers, telescopes, periscopes, rangefinders, dial sight, and cathode ray tubes.



Small Arms Limited

Established on August 7, 1940, to produce No. 4 rifles and bayonets at Long Branch, Ontario, Small Arms Limited is now turning out rifles and Sten machine carbines on a mass production basis. Its output, at the rate of thousands of small arms weekly, compares favourably in quantity and quality with United Kingdom production of the same weapons.

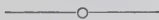
Plant capacity and production schedules have been steadily expanded. On October 28, 1940, authority was given to treble the original rifle production program. At the end of June, 1941, the company was further instructed to expand capacity with a view to boosting output to six times the volume originally scheduled.

In April, 1942, rifle production was double that of January. September output was double that of April. Production for the third quarter of 1942 was almost nine times that of the corresponding quarter the previous year. Further expansion is under way to increase output by 30 per cent over present schedules.

During July, 1941, the company was instructed to install a plant for the manufacture of the Sten machine carbine. The initial lot of carbines was delivered seven

months after receipt of the plans. In August, 1942, assembly schedules of the Sten carbine were quadrupled. This expansion is now well advanced.

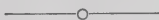
Small Arms Limited is now one of the largest small arms manufacturing plants on the continent. More than 60 per cent of the company's 5,000 employees are women.



Toronto Shipbuilding Company Limited

Toronto Shipbuilding Company Limited was incorporated as a Government-owned Company on October 21, 1941, to operate a Toronto shipbuilding property purchased by the Government. It acquired the waterfront property of the Dufferin Paving Company and leased adjacent land from the Toronto Harbour Commission to expand existing facilities of the original yards by 50 per cent.

The company has been engaged in building minesweepers of the "Bangor" and "Algerine" classes for the Shipbuilding Branch of the Department of Munitions and Supply. Up to mid-November, 1942, more than 20 minesweepers had been launched and keels had been laid for several others. Most of these minesweepers have been completed and delivered in Toronto, and a small number of them, after approximately 75 per cent completion at Toronto, have left the docks and been finished at tide-water. The company has in excess of 3,200 employees.



Trafalgar Shipbuilding Co. Limited

Trafalgar Shipbuilding Co. Limited was formed as a Government-owned company on August 7, 1941. It is operated by the Department of Munitions and Supply to expedite the shipbuilding program, particularly in relation to priorities.

Working in close conjunction with the Shipbuilding Branch of the Department in arranging priorities for materials required, the procedure of the company is adapted to the United States priorities system. Trafalgar Shipbuilding Co. Limited also looks after the details of obtaining essentiality certificates for material and equipment bought in the United Kingdom for Canada's wartime shipbuilding program.

Veneer Log Supply Limited

Eastern as well as Western Canada is contributing to the production of the famous Mosquito and other aircraft in which plywood and veneer are employed. To assure adequate supplies for the United Kingdom and Canada, a Crown company, Veneer Log Supply Limited, with head office in Montreal, was established on August 13, 1942. The company purchases, inspects, and ships all hardwood veneer logs suitable for aircraft felled in Eastern Canada. It works in close co-operation with the Timber Controller. (See also Aero Timber Products Limited.)

Victory Aircraft Limited

Victory Aircraft Limited is a Crown company formed to operate the Malton aircraft plant of the National Steel Car Corporation Limited, which was expropriated by the Government on November 5, 1942. The plant, which is now tooling up to manufacture the giant four-motored Lancaster bomber, was taken over in order to expedite operations and to maintain a community of interest and co-operation between the plant management, the Department of Munitions and Supply, and the designers and builders of the Lancaster in Great Britain.

Under Government operation certain difficulties which threatened to impede production of Lancaster bombers for the Canadian aircraft program have been removed. The 32-ton Lancaster is the biggest service plane on the Canadian aircraft construction schedule.

Wartime Housing Limited

Wartime Housing Limited was incorporated on February 28, 1941, to make available living accommodation for munitions workers in crowded communities. Its construction projects now range from providing additional housing in heavily populated industrial cities to the development of entire new communities, complete with roads, sewers, sidewalks, schools, administration buildings, and social centres.

By December 1, 1942, the company had completed, pending, or under contract 17,441 houses, 93 staff houses, 10 dining halls, and 32 special buildings such as schools, administration buildings, and recreation centres, to a total value of nearly \$70 million.

These figures mark a notable increase in Wartime Housing construction since the beginning of 1942. At the end of December, 1941, the company had completed or under contract 5,401 houses, 35 staff houses, four dining halls, and two special buildings, to a total value of nearly \$19 million.

The company's home building program is standardized to four-room and six-room types of insulated houses, which are generally rented—subject to regional conditions—at \$22 and \$25 a month for four-room bungalows and \$30 a month for six-room dwellings. The houses are demountable and were designed purposely for removal or salvage.

Many large communal centres have been built at large munitions plants or near war plants in crowded cities. One of these centres accommodates 500 men. Five communal centres have just been completed to house 2,500 women employees of munitions plants. In addition to single and double rooms, each centre is equipped with a bowling alley, game room, snack bar, dining room, kitchens, lounges, and laundry units.

Based on information from the Department of Munitions and Supply regarding new industrial developments, the company endeavours to anticipate housing requirements in various parts of the country. It responds to appeals from plant managements in locations where

housing is required for additional personnel or to prevent abnormal turnovers of labour owing to poor housing. Following a request, a survey is made and if additional accommodation is found necessary, recommendations to that effect are made to the Government. Based on the increase in employment and available nearby accommodation, the number of houses or staff buildings required is estimated. When a new development is decided upon, the company appoints a paid administrator who acts as manager of the properties. If the housing development is in an established community, the support of a local Wartime Housing Committee is sought as a voluntary advisory board.

Wartime Housing developments cover 60 Canadian communities. Gross income from projects already occupied or under construction will amount to more than \$5 million a year.

Wartime Merchant Shipping Limited

Although no cargo vessels were built in Canadian shipyards between 1918 and 1938, the Dominion has met the challenge of this war by launching to date nearly 1,000,000 tons of merchant shipping.

This vast program of cargo vessel construction, by virtue of which Canada has achieved the greatest ship-building capacity in her history, is administered by Wartime Merchant Shipping Limited, a Crown company incorporated on April 4, 1941.

Working on a program calling for the construction of more than 300 ships at a cost of approximately \$500 million, the company is building 10,000-ton merchant vessels at a rate equal to that of the United Kingdom. During 1942, the ships were being launched at the rate of two a week.

When Wartime Merchant Shipping Limited was formed, it became necessary first to determine what type of cargo vessel would be adaptable to mass production under Canadian conditions. Similar steps had already

been taken by Great Britain, where a standard merchant ship was developed at the beginning of the war for war service and war production. This, too, was the ship finally adopted for the Canadian program. It has also been employed, with a few modifications, by the United States in its Liberty ship program.

Since Canada had built virtually no sea-going ships in twenty years, Wartime Merchant Shipping Limited faced its task with few facilities other than the ship repair organizations on both coasts. It also had the benefit of certain facilities created by the naval building program, but there were only two berths on the Pacific coast and six berths on the Atlantic coast equipped to build the 10,000-ton cargo vessel approved for the mass production schedule. The berths were well equipped but the personnel of the yards was small. Today, there are 20 cargo vessel berths in operation on the Pacific coast and 26 berths on the St. Lawrence River and Atlantic seaboard, employing more than 40,000 workers on merchant ship construction alone.

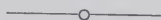
The success of the program has been a triumph of Canadian industrial organization and co-operation. At the end of the last war, since much of the equipment and machinery was imported, the Canadian content of Canadian-built ships ran to about 35 per cent. In this war, Wartime Merchant Shipping Limited faced serious import problems. It was necessary, therefore, to arrange with more than 300 contractors and sub-contractors to make parts of ships and equipment and machinery of various types and sizes on a scale never before undertaken in this country. Geographically, the job covered industrial Canada from coast to coast. Testifying to the co-ordination achieved, no ship completions have yet been delayed because of the non-arrival of any necessary equipment or machinery.

The company has also made steady progress in curtailing the use of critical materials in cargo ship construction. All imported woods have been eliminated. Substitution and redesign have saved seven tons of brass and copper, $3\frac{1}{2}$ tons of Manila, and $1\frac{1}{2}$ tons of tin in the construction of each ship.

Eighteen 4,700-ton cargo vessels are included in the program, but virtually all ships delivered to date have been of the 10,000-ton type. Original plans called for construction of 172 ships at an estimated cost of \$325 million, but the program has now been expanded to the present \$500 million figure.

On the occasion of the launching of the hundredth cargo ship of the Wartime Merchant Shipping Limited program in late December at a Pacific coast shipyard, some impressive figures of material consumption were quoted.

The 100 ships launched required about 300,000 tons of steel shapes and plates for the hulls only, 43 million rivets or equivalent welding, 500 miles of pipe and 60 million pounds of main and auxiliary engines, pumps, winches, and lesser components.



Wartime Metals Corporation

To meet increasingly serious shortages, Wartime Metals Corporation, a Crown company operating in collaboration with the Metals Controller, expanded its activities in the second half of 1942 to include the exploitation of mineral deposits for the production of chrome, molybdenum, tungsten, copper, vanadium, zinc, and lead. In addition, it undertook the buying, stocking, and selling of high-grade scrap brass ingots.

The company was incorporated on March 17, 1942, to assume the responsibility for the production in Canada of magnesium, and for other emergency projects in connection with the discovery, mining, and refining of non-ferrous war metals.

First responsibility of the corporation was the Government-owned Dominion Magnesium Limited at Haley, Ontario, where nine months after the first soil was turned actual production of much-needed magnesium was under way from the company's own dolomite field. (For details of this project see Magnesium under Metals Control, page 105.)

Wartime Metals" Corporation in certain instances operates, through the Metals Controller, for the account of Metals Reserve Company, the U.S. Government-owned metals finding agency.

By the end of 1942 the Canadian corporation had undertaken 15 projects.

1. **Chromeraïne Project**—Mill construction and underground work at this project in Quebec Province was progressing. Production of chrome concentrates is expected by March, 1943.

2. **Granby Consolidated**—This copper producer, in difficulties because of labour and material shortages, is now being administered by the Government. The rated capacity is 36 million pounds of refined copper per year. Provision has been made to give financial and priority assistance in installing additional equipment for increased output when additional manpower can be obtained. The operating management has not been changed, but the mine is being supervised by Wartime Metals Corporation.

3. **Britannia Mining and Smelting Company**—Also in difficulties because of labour and material shortages, this British Columbia mine has been assisted by the Metals Controller. Without change of management, it was placed under the supervision of Wartime Metals Corporation. Rated capacity is 25 million pounds of refined copper per year.

4. **Kam Kotia Porcupine Mines**—First steps leading toward production of copper at this northern Ontario mine have been undertaken by Wartime Metals Corporation.

5. **Tyee Project**—This British Columbia property is being developed by Wartime Metals Corporation to produce copper and zinc in the form of concentrates.

6. **Dominion Magnesium Limited**—The magnesium project at Haley, Ontario, was nearing full production at the end of 1942 (see page 105).

7. **Tetreault Lead and Zinc Property**—This Quebec mine, under lease to Siscoe Gold Mines Limited, is being operated by Siscoe under the supervision of Wartime Metals Corporation. Concentrates are being shipped in volume.

8. **Lake Geneva Mining Company**—This north-western Ontario lead-zinc mine is being developed at depth to recover available ore. New ore sources are being investigated by Wartime Metals Corporation.

9. **Kootenay-Florence Mining Company**—Wartime Metals Corporation is now operating this old property to obtain zinc and lead.

10. **Molybdenite Corporation of Canada** — The La Corne property in Quebec Province has been taken over by Wartime Metals Corporation. The mine is producing at a moderate rate and a new and larger mill may be built.

11. **Zenith Molybdenum Company**—Development of this mill and mine in eastern Ontario has been undertaken by Wartime Metals Corporation to secure production from Zenith ores and from ores brought in from district properties.

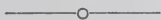
12. **Emerald Tungsten Mine**—This British Columbia property has been taken over by the Government and is being developed by Wartime Metals Corporation for the production of tungsten to be used in Canada. It is considered to be one of the promising tungsten deposits so far discovered in North America.

13. **Vanadium**—Ash residues from oil-burning ships on both Canadian coasts are being collected by Wartime Metals Corporation. These residues are shipped to a commercial plant in the United States for the recovery of the vanadium content.

14. **Scrap Brass**—On instructions from the Metals Controller, Wartime Metals Corporation acts as an agent for the acquisition and sale of secondary ingots for use in Canadian war industry. The ingots are being

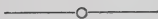
manufactured by ingot makers to specifications of the Controller.

15. **High Lake Molybdenite**—Diamond drilling of molybdenite showings in the Kenora District was undertaken to explore the possibilities of another source of molybdenum.



War Supplies Limited

War Supplies Limited was incorporated on May 13, 1941, as a means of implementing the Declaration of Hyde Park. Its function is to negotiate and receive orders from departments of the United States Government for war supplies to be manufactured in Canada.



INDEX

A

- Abrasives, 104
- Acetylsalicylicacidester ("Aspirin"), 78
- Administrators, 8, 67
- Advisory Committees
 - Babbitt Advisory Committee, 116
 - Dyestuff Advisory Committee, 79
 - Lumber Advisory Committee, 187
 - Motor Vehicle Dealers' Advisory Committee, 124
 - Motor Vehicle Manufacturers' Advisory Committee, 124
 - Non-ferrous Wrought Alloys Advisory Committee, 120
 - Plastics Advisory Committee, 77
 - Solders Advisory Committee, 116
 - Technical Advisory Committee on Alloy and Special Steels, 165
- Aerial bombs, 37, 38
- Aero Timber Products Limited, 186, 199
- Air-conditioning equipment, 175
- Aircraft, 32
 - Anson, 34, 206
 - Avro-Lancaster, 34, 35, 214
 - Anti-aircraft machine guns, 59, 60
 - Bristol Bolingbroke, 34
 - Catalina PBV-5, 34
 - Control, 71
 - Curtiss navy dive bomber ("Helldiver"), 34
 - Engines, 35
 - Fairchild Cornell, 34
 - Harvard, 34
 - Hurricane, 34
 - Lancaster, 34, 35
 - Link trainer, 31
 - Machine guns, 60
 - Mosquito, 34, 35
 - Noorduyn Norseman, 34, 35
 - Overhaul, 36
 - Payroll, 33
 - PBV-5 Catalina, 34
 - Production, 24, 32
 - Purchasing contracts, 15
 - Tenders, 65
 - Veneer Log Supply Limited, 214
 - Victory Aircraft Limited, 214
- Air Force clothing, 52, 53
- Airports construction, 14, 44
- Alcohol, 73
- "Algerine" minesweeper, 213
- Alkylate, 200
- Allied War Supplies Corporation, 46, 199
- Alloys and metals, purchasing contracts, 15
- Aluminum, 91
- Ambulances, 42
- Ammonium chloride, 79
- Ammunition, 25, 37
 - Armour-piercing, 40, 41
 - Ball, 40
 - Bombs, 500-pound aerial, 38
 - Practice, 38
 - Smoke, 46
 - Trench mortar, 38
 - Cartridge cases, 38
 - Depth charges, 38
 - Fuzes, 38
 - Gaines, 38
 - Grenade, rifle, 38
 - Incendiary, 40
 - Mines, anti-tank, 38
 - Primers, 38
 - Pyrotechnics, 38
 - Shells, 37
 - Small arms, 40
 - Tracer, 40
- Ammunition filling plants, 47, 200
- Anchors, 58
- Anson, 34
- Anti-aircraft machine guns, 59, 60
 - Mountings, 59
- Anti-gas clothing, purchases, 55
- Anti-freeze, 74, 75, 79
- Antimony, 92
- Anti-submarine equipment, 58
- Anti-tank guns, 59
 - Mines, 38
 - Rifle, 60
- Appliances, electrical, restrictions, 180
- Armoured cars, 42
- Armour-piercing ammunition, 40, 41
- Armour plate, 160
- Arsenals, 37
- Arsenic, 93
- Artillery guns, 59
 - Tractors, 42
- Asbestos, 93
- Asphalt, 126, 132
- "Aspirin" (acetylsalicylicacidester), 78
- Atlas Plant Extension Limited, 201
- Audits, 29
- Automobiles, manufacture control, 121

Automotive Production Branch, 41

Automotive vehicles, 41

- Ambulances, 42
- Armoured cars, 42
- Artillery tractors, 42
- Field workshops, 42
- Fire trucks, 42
- Purchases, 15
- Production, 24, 26
- Reconnaissance cars, 42
- Scout cars, 42
- Trailers, 42
- Universal carriers, 42
- Wireless trucks, 42

Avro-Lancaster, 34, 35

Avro-Anson, 34, 206

B

Babbitt, 113

- Advisory Committee, 116

Bakelite, 77

Ball ammunition, 40

"Bangor" minesweeper, 213

Barrack services purchasing contracts, 15

Barrack stores, 56

Barrett Chute power development, 143

Base ships, 63

Battle practice targets, 65

Bauxite, 91

Bayonets, 212

Beauharnois Light, Heat and Power Company, 143

Beds and bedding purchasing contracts, 15, 56

Beds, restrictions, 180, 183

Bicycles, 173

Binder twine, 169

Binoculars, 212

Bird River exploration, 94

Bismuth, 93

Black River power development, 143

Blankets, purchases, 54

Bleaching, 74

Board of Economic Warfare, 90

Boats, 63-65

Bofors gun, 60
Mounting, 60

Bolingbroke, Bristol, aircraft, 34

Bomber, navy dive, 34, 35

Bomb-loading dinghies, 65

Bombs, 37, 38

Bomb-throwers, 60

Boots, purchases, 53

Boys anti-tank rifle, 60

Brass, 95

Bread purchases, 55

Bren gun, 60
Magazines, 61
Tripods, 61

Bristol Bolingbroke, 34

Britannia metal, 97, 112

Britannia Mining and Smelting, 219

Bronze, 95

Browning aircraft machine gun, 60
Tank type machine gun, 60

Brucitic limestone, 105

Buna-S rubber, 149
Polymer Corporation, 210

Building permits, 79

Buses, 190
Manufacture control, 121

Butadiene, 211

Butter purchases, 55

Buttons, 77

Butyl rubber, 149
Polymer Corporation, 210

C

Cadmium, 94

Camouflage netting, 58

Canadian Institute of Steel Construction, 163

Canadian Wool Board, 208

Caps, purchases, 53

Capital assistance, 10

Capital commitments, plant expansion, 10, 11

Carbine, Sten machine, 60
Small Arms Limited, 212

Cargo vessels, 63
Capacity of, 64

Carriages, gun, 59
National Railways Munitions Limited, 209

Cartridge cases, 38

Catalina flying boat, PBV-5, 34

Cathode ray tubes, 212

Cellophane, 180

Cellulose, 200, 201

Chemicals, 45, 199
Control, 72
Production, 26, 72

- Chemicals and explosives purchasing contracts**, 15
 - Chlorine**, 74
 - Chrome**, 94
 - Chromeraine project**, 94, 219
 - Chûte à Caron power development**, 92
 - Citadel Merchandising Company Limited**, 84, 202
 - City Gas Company**, 147, 148
 - Clinometers**, 212
 - Clothing, purchases**, 15, 53
 - Coal tar**, 76
 - Coast defence batteries**, 44
 - Cobalt**, 95
 - Coffee purchases**, 55
 - Coke oven gas plant**, 146
 - Collapsible assault boats**, 65
 - Combined Production and Resources Board**, 30
 - Commissary supplies**, 52, 55
 - Compasses, navigation**, 31
 - Conservation**, 28, 118
 - Construction Branch**, 43
 - Contracts, 32
 - Control, 79
 - Construction and defence project purchases**, 15
 - Contracts awarded**, 14
 - Controllers**, 7, 67
 - Aircraft, 71
 - Chemicals, 72
 - Construction, 79
 - Machine tools, 83
 - Metals, 87
 - Motor vehicle, 121
 - Oil, 126
 - Power, 142
 - Rubber, 148
 - Ship repairs and salvage, 159
 - Steel, 160
 - Supplies, 167
 - Timber, 184
 - Transit, 188
 - Transport, 196
 - Converted boats**, 65
 - Co-ordinator of Controls**, 67
 - Copper**, 95
 - Britannia Mining and Smelting, 219
 - Granby Consolidated, 219
 - Kam Kotia Porcupine Mine, 219
 - Tyee Project, 219
 - Cordage purchases**, 58
 - Restrictions, 169
 - Cork**, 169
 - Cornell, Fairchild**, 34
 - Corundum**, 104
 - Corvettes**, 63
 - Cost auditing**, 29
 - Crash boats**, 65
 - Crown companies**, 9
 - Aero Timber Products Limited, 199
 - Allied War Supplies Corporation, 199
 - Atlas Plant Extension Limited, 201
 - Citadel Merchandising Limited, 202
 - Cutting Tools and Gauges Limited, 203
 - Fairmont Company Limited, 204
 - Federal Aircraft Limited, 205
 - Machinery Service Limited, 207
 - Melbourne Merchandising Limited, 208
 - Merchant Shipping Limited, 216
 - National Railways Munitions Limited, 209
 - Park Steamship Company Limited, 210
 - Plateau Company Limited, 210
 - Polymer Corporation Limited, 210
 - Research Enterprises Limited, 211
 - Small Arms Limited, 212
 - Toronto Shipbuilding Company Limited, 213
 - Trafalgar Shipbuilding Company Limited, 213
 - Veneer Log Supply Limited, 214
 - Victory Aircraft Limited, 214
 - Wartime Housing Limited, 215
 - Wartime Metals Corporation, 218
 - War Supplies Limited, 221
 - Crude oil**, 126
 - Cruiser tank (Ram)**, 43
 - Curtiss navy dive bomber ("Helldiver")**, 34, 35
 - Cutlery**, 56
 - Cutting tools**, 83
 - and Gauges Limited, 203
- D**
- Daylight saving**, 144
 - De Cew Falls power development**, 143
 - Defence Projects Construction Branch**, 43
 - Defence Purchases, Profits Control and Financing Act**, 5
 - Defence Purchasing Board**, 5
 - Deloro Smelting and Refining Company**, 95
 - Denatured alcohol**, 73
 - Dental supplies, purchases**, 16
 - Department of Munitions and Supply Act**, 6
 - Depth charges**, 38
 - Derrick scows**, 65
 - Destroyers**, 63

Dial sights, 212
Diamonds, 104
Dinghies, 65
Dishes, 56
Distilleries, 73
Dive bomber, 35
Dock-yard stores, purchases, 15
Dolomite, 105
Dominion Magnesium Limited,
 105, 218
Dominion Natural Gas Company, 148
Dopes, 77
Drive-yourself cars, 192
Dry docks, 44, 159
Dufferin Paving Company, 213
Dyestuff Advisory Committee, 79
Dynamite, 199

E

Eggs, purchases, 55
Electrical appliances, restrictions, 180
 Devices, 211
 Equipment purchases, 15
Electric fans, restrictions, 183
 Irons, restrictions, 183
Emerald Tungsten Mine, 220
Engines, 35
Ethylene glycol, 79
Equipment, air-conditioning,
 restrictions, 175
 Anti-gas, purchases, 55
 Anti-submarine, 58
 Electrical, purchases, 15
 Fire-fighting tank pump fire
 extinguishers, 58
 Gas decontamination, purchases, 55
 Wireless, 58
Evaporated milk purchases, 55
Explosives and chemicals production,
 25, 26, 45, 199

F

Fairchild Cornell, 34
Fairmont Company Limited, 151, 204
Falconbridge Company, 109
Fans, electric, restrictions, 183
Federal Aircraft Limited, 205
Ferries, 192
Fibre, hard, restrictions, 169

Field guns, 59
 Workshops, 42
Film, transparent, restrictions, 180
Fire control instruments, 211
 Fighting equipment, purchases, 15
 Fighting tank and fire extinguishers, 58
 Trucks, 42
Fluorspar, 104
Flying boats, **PBY-5 Catalina**, 34
 Schools, 44
Foodstuffs, purchases, 55
Four-inch guns (naval), 59, 60
Freight, railway, 196
 Vessels, capacity of, 64
Fuel oil, 126
Fuel purchases, 15
Furniture, metal, restrictions, 181
Fuzes, 38

G

Gaines, 38
Gas, 145, 147, 148
Gas masks, purchases, 52
Gasoline, 126
 Purchases, 15, 57
 Rationing, 133
 Watercraft rationing, 138
**Gas-welding Non-Ferrous Metals
 Committee**, 119
Gate vessels, 65
**Gauge and Cutting Tool Production
 Branch**, 83, 203
Gauges, 83, 203
General purchasing, 50
Gloves, purchases, 54
Glycerine, 75
Graphite, 104
Granby Consolidated, 219
Grand' Mere power development, 143
Grenades, rifle, 38
Guayule, 152, 157
**Guns and Small Arms Production
 Branch**, 58
Guns, aircraft machine, 60
 Anti-aircraft machine, 59, 60
 Anti-tank, 59
 Artillery, 59
 Bofors, 60
 3.7-inch, 60
 Bomb throwers, 60

Bren, 60
 Magazines, 61
 Tripods, 61
 Browning, aircraft machine, 60
 Tank type machine, 59
 Carriages, 59
 Machine, 60, 61
 Naval, 59, 60
 National Railways Munitions
 Limited, 209
 Production, 25
 Rifles, 60, 61
 Boys anti-tank, 60
 Sights, 212
 Smoke dischargers, 60, 61
 Sten machine carbine, 60, 61
 Tank, 59
 Tractors, field gun, 59
 Trailers, field gun, 59
 Trench mortars, 60
 Gunpowder, 200, 201

H

Hangars, 44
 Harbour utility boats, 65
 Hard fibres, restrictions, 169
 Hardware purchases, 15, 57
 Harvard, 34
 Helmets, steel, purchases, 57, 58
 Hemp, manila, 169
 High Lake Molybdenite, 221
 Housing, 215
 Hurricane, 34
 Hyde Park Agreement, 221

I

Incendiary ammunition, 40
 Industrial alcohol, 73
 Industrial capacity, 24
 Infantry tank, 43
 Ile Maligne, 91
 Instruments, purchases, 15
 International Nickel Company, 109
 Internment clothing, 52
 Iron pyrites, 105
 Irons, electric, restrictions, 183

J

Java hemp, 169
 Jitneys, 188, 194
 Jobbers and Distributors Advisory
 Committee, 120
 Joint Materials Co-ordinating Com-
 mittee of Canada and U.S., 30, 90

K

Kam Kotia Porcupine Mines, 219
 Kapok, 172
 Plateau Company Limited, 210
 Kerosene, 132

Kit bags, purchases, 54
 Kitchen equipment, purchases, 15
 Kootenay-Florence Mining Company,
 220

L

Lacquers, 77
 La Gabelle power development, 143
 Lancaster, 34, 35
 Victory Aircraft Limited, 214
 Lead, 105
 Kootenay-Florence Mining Company,
 220
 Lake Geneva Mining Company, 220
 Tetreault Lead and Zinc property, 220
 Lee-Enfield rifle, 60
 Lifeboats, 63
 Life-saving apparatus, 172
 Link trainers, 31
 Lock, Builders' and Cabinet Hardware
 Metals Committee, 119
 Lumber, 184
 Advisory Committee, 187
 —and building supplies, purchases, 15
 Lye, 79

M

Machine guns, 60, 61
 Machinery purchases, 16
 Machinery Service Limited, 86, 207
 Machine Tools Control, 83
 Citadel Merchandising Company, 84, 202
 Cutting Tools and Gauges, 202
 Machinery Service Limited, 207
 Magazines, Bren, 61
 Magnesium, 105, 218
 Manganese, 108
 Manila hemp, 169
 Mattresses, restrictions, 180
 McNaughton, Lt.-General A. G. L., 106
 Meats, purchases, 55
 Medical and dental supplies,
 purchases, 16
 Melbourne Merchandising Company,
 171, 208
 Merchant ships, 62
 Capacity of, 64
 Wartime Merchant Shipping Limited,
 216
 Mercury, 108
 Metal Reserve Company, 88
 Metal tags, restrictions, 97
 Metals Control, 87
 Aluminum, 91
 Antimony, 92
 Arsenic, 93
 Asbestos, 93
 Bauxite, 91
 Bismuth, 93
 Brass, 95
 Bronze, 95
 Brucite, 105
 Cadmium, 94

Chrome, 94
 Cobalt, 95
 Copper, 95
 Corundum, 104
 Diamonds, 104
 Dolomite, 105
 Fluorspar, 104
 Graphite, 104
 Lead, 105
 Magnesium, 105
 Manganese, 108
 Mercury, 108
 Mica, 108
 Molybdenum, 109
 Muscovite, 108
 Nickel, 109
 Platinum, 110
 Pyrites, iron, 105
 Radium, 111
 Silica, 111
 Silver, 111
 Tin, 112
 Tungsten, 116
 Vanadium, 117
 Zinc, 118
Mica, 108
Mines, anti-tank, 38
Minesweepers, 63, 213
 Toronto Shipbuilding Limited, 213
Molasses, 74, 76
Molybdenite Corporation of Canada,
 220
Molybdenum, 109
 High Lake Molybdenite, 221
 Molybdenite Corporation of Canada, 220
 Zenith Molybdenum, 220
Mortars, trench, 60
Mosquito, 34, 35
 Veneer Log Supply Limited, 214
Motorcycles, gasoline rationing
 restrictions, 135
Motor torpedo boats, 63
Motor Vehicle Control, 121
 Dealers' Advisory Committee, 124
 Manufacturers' Advisory Committee,
 124
Mountings, gun, 59
Munitions and Supply
 Act, 6
 Personnel, 3
 Powers, 6

N

National Lumber Advisory
 Committee, 187
National Railways Munitions
 Limited, 209
Natural gas, 145, 147
Naval clothing, purchases, 53
Naval gun mountings, 59
 Guns, 59, 60
 Instruments, 58
 Stores, 58
Navigation compasses, 31
Navy dive bomber, Curtiss
 "Helldiver," 34, 35

Niagara power development, 143
Nickel, 109
Nitrates, 201
Nitrocellulose, 200, 201
Non-ferrous Metals Administrator, 90
Non-ferrous Wrought Alloys
 Advisory Committee, 120
Noorduyn Norseman, 34, 35
Novelties, metal, restrictions, 180
Nylon, 173
 Plateau Company Limited, 210

O

Office furniture and equipment
 purchases, 16
Ogoki power development, 143
Oil Control, 126
 Crude, 126
 Fuel, 126, 129, 130
 Pipeline, 128
 Rationing, 133
 Regional offices, 140
 Watercraft rationing, 138
Oil purchases, 57
Optical glass, 211
 Instruments, 211
Ore dressing laboratories, 117
Ordnance production, 25
Overalls, purchases, 54
Overhaul, 36

P

Paints and paint supplies,
 purchases, 16, 57
Parachutes, 31
Park Steamship Company Limited, 210
Patrol boats, 63
PBY-5 Catalina flying boats, 34
Pembroke Electric Power Company,
 143
Personal equipment, purchases, 16
Periscopes, 212
Personal equipment, 31, 50
Petroleum, 126
Phenol formaldehyde, 77
Phlogopite, 108
Photographic equipment purchases, 16
Pidgeon, Dr. Lloyd M., 106
Pig iron, 161
Pipeline, oil, 128
Pitch and pitch coke, 76
Plant expansion, 10
Plastics, 76
 Plastics Advisory Committee, 77
 Raincoats, plastic, 77
Plateau Company Limited, 173, 210
Platinum, 110

- Plating**, 94, 109
 - Plywood**, 185
 - Polymer Corporation Limited**, 149, 210
 - Polymerization**, 210, 211
 - Pom-poms, naval**, 59, 60
 - Power Control**, 142
 - Aluminum, 91
 - Chûte à Caron, 92
 - Ile Maligne, 91
 - Power development**
 - Barrett Chute, 143
 - Beauharnois Light, Heat & Power, 143
 - De Cew Falls, 143
 - Grand' Mere, 143
 - La Gabelle, 143
 - La Tuque, 143
 - Minnewanka Lake Project, 143
 - Musquash River, 143
 - Ogoki, 143
 - Quebec Streams Commission, 143
 - St. Maurice Power Corporation, 143
 - Shawinigan Falls, 91
 - West Kootenay Power Company, 143
 - Power, pulp and paper**, 145
 - Gas, 145
 - Practice bombs**, 38
 - Primers**, 38
 - Priorities**, 16
 - Branch, 8, 16
 - Controlled Materials Plan, 20
 - Officer, 17
 - Individual preference rating certificates, 19
 - Industry blanket ratings, 19
 - Project ratings, 20
 - United States division, 17
 - United Kingdom division, 17
 - Production, general**, 23
 - Propane gas**, 146
 - Protective clothing, purchases**, 55
 - Pulling boats**, 65
 - Pulp and paper**, 74, 145, 147
 - Pulpwood**, 185, 200
 - Purchasing Branch**,
 - Anti-gas equipment, 55
 - Automotive transport, 57
 - Barrack stores, 56
 - Blankets, 54
 - Boots and shoes, 53
 - Caps, 53
 - Clothing, 52
 - Coats, 53
 - Contracts, 15
 - Electrical and radio, 57
 - Foodstuffs, 55
 - Fuels, 57
 - Gasoline, oil and paints, 57
 - Gloves, 54
 - Jackets, 53
 - Kit bags, 54
 - Lumber, 56
 - Machine tools and hardware, 57
 - Medical supplies, 55
 - Overalls, 54
 - Routine, 12
 - Shirts, 54
 - Socks, 54
 - Tents, 55
 - Textiles, 53
 - Trousers, 53
 - Underwear, 54
 - Uniforms, 53
 - Web equipment, 52
 - Pyrites, iron**, 105
 - Pyrotechnics**, 38
- Q**
- Quebec Streams Commission**, 143
 - Quinine**, 77
- R**
- Radio equipment**, 58
 - Radios, restrictions**, 174
 - Radium**, 111
 - Railways**, 196
 - Raincoats, plastic**, 77
 - Purchases, 53
 - Ram tank**, 43
 - Rangefinders**, 212
 - Rationing, gasoline**, 133
 - Tires, 149
 - Reclaim rubber**, 150, 204
 - Reconnaissance cars**, 42
 - Refrigerator purchases**, 58
 - Restrictions, 174
 - Rescue launches**, 65
 - Research Enterprises Limited**, 211
 - Retreading, tire**, 150
 - Rifle, Small Arms Limited**, 212
 - Rifle grenades**, 38
 - Rifles, Lee-Enfield**, 60
 - Boys anti-tank, 60
 - Road repairs**, 76, 126, 131, 132
 - Rope**, 169
 - Rubber Control**, 148
 - Advisory Committee, 152, 158
 - Conservation and Technical Committee, 158
 - Polymer Corporation Limited, 210
 - Reclaim, 204
 - Substitutes Advisory Committee, 152
 - Synthetic, 148, 210
 - Synthetic Rubber Technical Advisory Committee, 158
- S**
- St. Maurice Power**, 143
 - Safes, metal, restrictions**, 183
 - Salicylates**, 78
 - Scheelite ore**, 116
 - Scrap rubber**, 150, 204
 - Salvage and supply boats**, 65
 - Scout cars**, 42
 - Scrap brass**, 220
 - Scows**, 65

- Service aircraft**, 32
 - Shawinigan Electro Metals Company**, 107
 - Shawinigan Falls**, 91, 143
 - Shawinigan Rapide Blanc Plant, 143
 - Shells**, 37
 - Shell Filling, 200
 - Ships**, 62
 - Shipbuilding Branch, 62
 - Aircraft tenders, 65
 - Base, 63
 - Battle practice targets, 65
 - Bomb-loading dinghies, 65
 - Capacity of ship, 64
 - Cargo, 63
 - Collapsible assault boats, 65
 - Converted, 65
 - Corvettes, 63
 - Crash boats, 65
 - Derrick scows, 65
 - Destroyers, 65
 - Flat scows, 65
 - Gate vessels, 65
 - Harbour utility craft, 65
 - Lifeboats, 63
 - Merchant, 62
 - Wartime Merchant Shipping Limited, 216
 - Minesweepers, 63
 - Motor torpedo, 63
 - Park Steamship Company Limited, 208
 - Patrol boats, 63
 - Production, 27
 - Pulling, 65
 - Purchases, 16
 - Rescue launches, 65
 - Scows, 65
 - Service dinghies, 65
 - Ship Repairs and Salvage Control, 65, 159
 - Small boats, 65
 - Special service, 65
 - Toronto Shipbuilding Co. Ltd., 213
 - Trafalgar Shipbuilding Co. Ltd., 213
 - Wartime Merchant Shipping Limited, 216
 - Whalers, 65
 - Shirt purchases**, 54
 - Shoe purchases**, 53
 - Show room**, 52
 - Signs, metal, restrictions**, 180
 - Silica**, 111
 - Silk**, 173
 - Plateau Co. Ltd., 210
 - Silver**, 111
 - Sisal**, 169
 - Skates, restrictions**, 180
 - Sitka spruce**, 186
 - Small arms**, 58
 - Ammunition, 39
 - Limited, 212
 - Production, 25, 58
 - Small boats**, 58
 - Smoke dischargers**, 60
 - Bombs, 46
 - Floats, marine, 31
 - Generators, 31
 - Soap**, 75
 - Socks, purchases**, 54
 - Soda ash**, 78
 - Sodium carbonate**, 78
 - Solders**, 112
 - Advisory Committee, 116
 - Special service boats**, 65
 - Sphagnum**, 120
 - Staggered hours**, 189
 - Statistics**, 14
 - Steel Control**, 160
 - Atlas Plant Extension Ltd., 201
 - Helmets, 57, 58
 - Sten machine carbines**, 60, 61
 - Small Arms Ltd., 212
 - Stoves, restrictions**, 176
 - Street cars**, 190
 - Styrene**, 210, 211
 - Substitutions**, 59, 89, 94, 105, 111, 117, 152, 186, 217
 - Sulphuric acid**, 78
 - Supplies Control**, 167
 - Synthetic rubber**, 148
 - Polymer Corporation, 210
 - Synthetic Rubber Technical Advisory Committee**, 154, 157, 158
- T**
- Tankers, oil**, 127
 - Three-point-seven-inch (3.7") anti-aircraft gun**, 60
 - Tank guns**, 59
 - Tank Production Branch, 43
 - Tanks, cruiser (Ram)**, 43
 - Infantry (Valentine), 43
 - Tank, pump fire extinguisher**, 58
 - Taxis**, 191
 - Technical Advisory Committee on Alloy and Special Steels**, 165
 - Tender routine**, 12
 - Tenders, aircraft**, 65
 - Telescopes**, 212
 - Tents and other canvas goods, purchases**, 16, 55
 - Tetraut Lead and Zinc Property**, 220
 - Terneplate**, 112
 - Textile purchases**, 53
 - Timber Control**, 184
 - Tin**, 112
 - Tinfoil**, 112
 - Tires and tire rationing**, 123, 148-158
 - Toasters, restrictions**, 183
 - Toronto Shipbuilding Company Limited**, 213
 - Tourists, gas rationing**, 137
 - Toys, metal**, 180

Turner Valley, 129
 Tracer ammunition, 40
 Tractors, gun, 42
 Trafalgar Shipbuilding Company Limited, 213
 Traffic increases, 189
 Trailers, automotive, 42
 Gun, 59
 Training aircraft, 31, 33
 Trains, railway, 196
 Tramways, 190
 Transit Control, 188
 Regional directors, 194
 Transparent film restrictions, 180
 Transport Control, 196
 Transport Department, 196
 Trench mortar bombs, 38
 Trench mortar guns, 60, 61
 Tribal class destroyers, 65
 Tripods, Bren, 61
 Trucks, wireless, 42
 Manufacture control, 121
 Tungsten, 116
 Emerald Tungsten Mine, 220
 Twelve-pounder naval gun, 59, 60
 National Railways Munitions Ltd., 209
 Typewriters, purchases, 56
 Tyee project, 219
 Twine, 169

U

U-drive cars, 192
 Underwear purchases, 54
 Uniform purchases, 53
 Union Gas Company, 145, 147, 148
 Universal carriers, 42
 United Gas and Fuel Company, 148
 Urea formaldehyde, 77

V

Vacuum cleaners, restrictions, 178
 Valentine tank, 43
 Vanadium, 117
 Vickers naval gun, 59, 60
 Veneers, 185
 Veneer Log Supply Limited, 186, 214
 Vegetable purchases, 55
 Victory Aircraft Ltd., 214
 Vidal Process, 206

W

War Committee, Cabinet, 30
 War Contracts Depreciation Board, 10
 War Metals Advisory Committee, 120
 War Supplies Limited, 221
 War Supply Board, 5
 Wartime Housing Limited, 215
 Wartime Industries Control Board, 8, 67
 Wartime Industrial Transit Plan, 121, 142, 193
 Wartime Merchant Shipping Limited, 64, 216
 Wartime Metals Corporation, 218
 Wartime Prices and Trade Board, 8, 67, 90, 161, 165, 173-183, 208
 Washing Machine Advisory Committee, 179
 Washing machine restrictions, 179
 Washing soda, 78
 Waterproof coats, purchases, 53
 Wax purchases, 56
 Web equipment, 52
 West Kootenay Power Co., 143
 Whalers, 65
 Wharves, 44
 Windsor Gas Co., 147, 148
 Winter coat purchases, 53
 Wireless equipment, 58
 Wireless trucks, 42
 WO3, 116
 Women's Auxiliary Corps clothing purchases, 52
 Women in industry, 27, 40, 162, 202, 209, 212, 213
 Wool, 208
 Board, 208
 Woollens, 208
 Workshops, field, 42

Y

Yarns, wool, 208

Z

Zenith Molybdenum Co., 220
 Zinc, 118
 Oxide Committee, 119
 Tetreault Lead and Zinc Property, 220
 Lake Geneva Mining Co., 220
 Kootenay Florence Mining Co., 220

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